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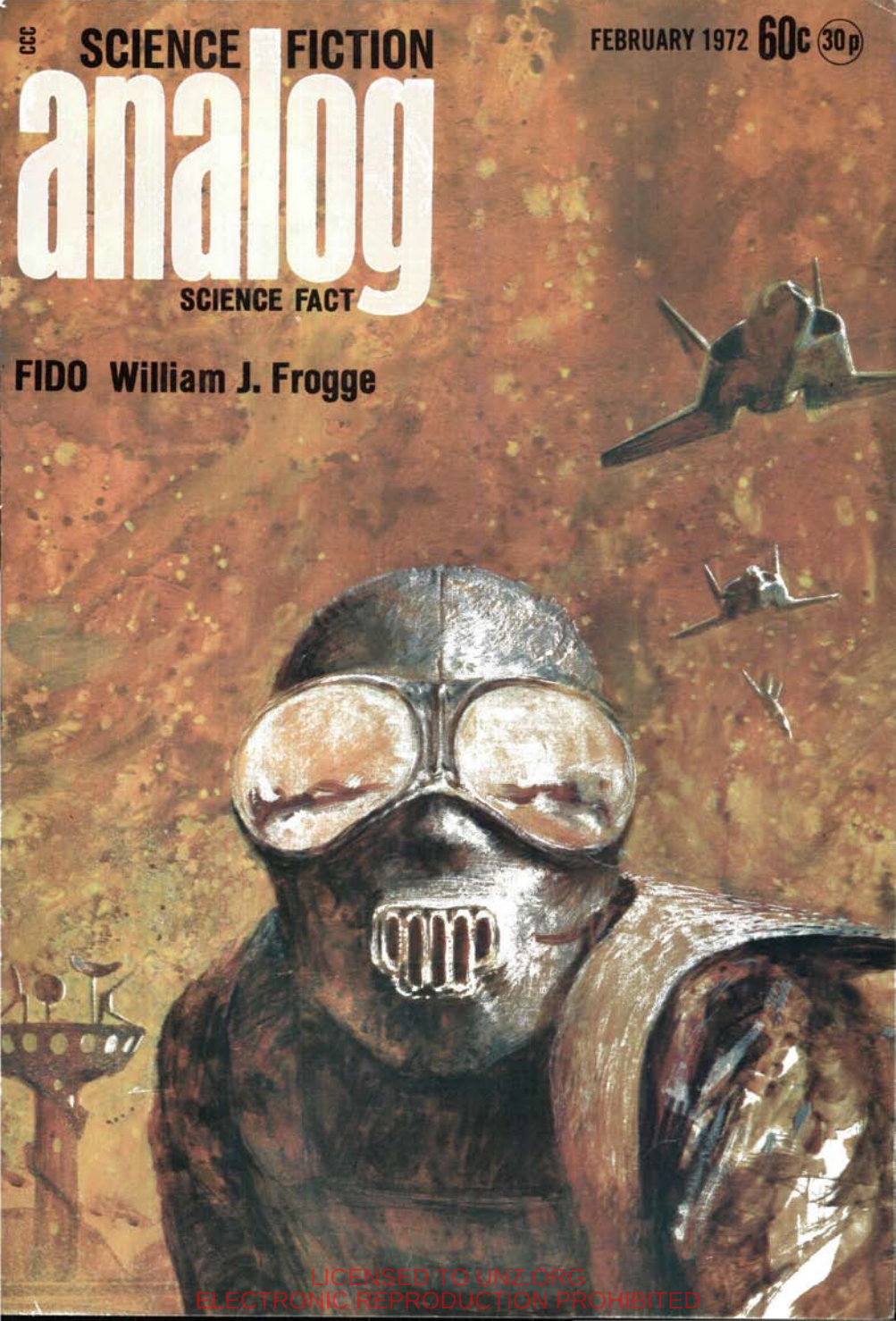

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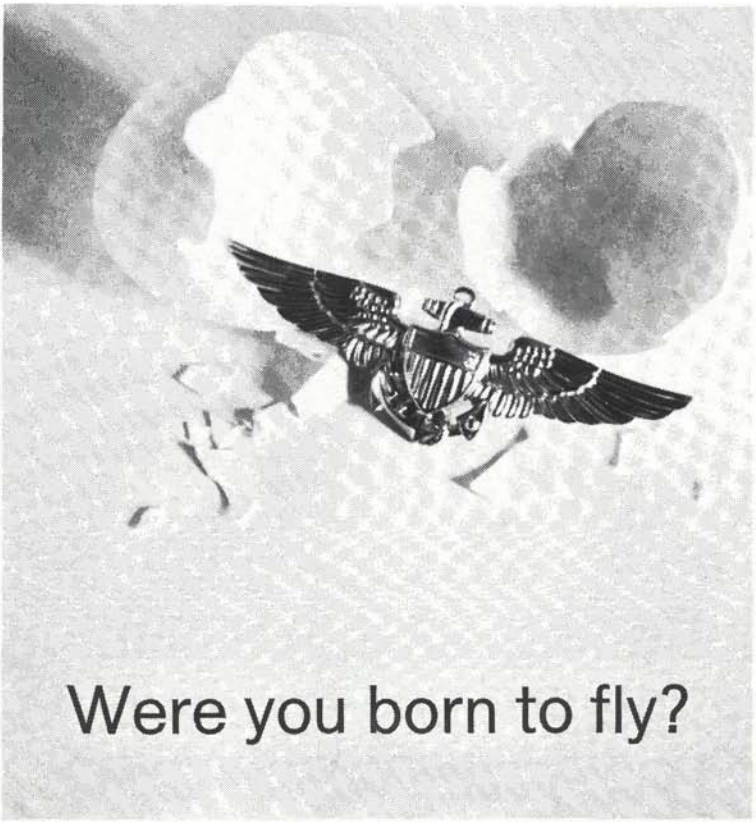

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AN EDITORIAL BY BEN BOVA

THE POPULAR WISDOM

No one can replace John W. Campbell.

Most of us started reading science fiction in Astounding/Analog. The writers we cherish most, the stories we remember best, the *ideas* that fascinated or infuriated us—all of these came from these pages, from John Campbell's magazine.

There will never be another like him. Yet the world goes on, and so will this magazine.

Certainly we want Analog to remain very much the same magazine it has always been. And just as certainly, it will change. Hopefully, it will evolve and grow along the lines that John Campbell set for Analog more than thirty years ago.

As I make the notes for this editorial, I'm sitting in a jet airliner some 25,000 feet above the ground, heading from Boston toward Cleveland at close to the speed of sound. While asking myself just what is the basic guideline for Analog, I'm suddenly struck by how much the world has changed over the past thirty years.

In the late 1930s and early 1940s, anyone who seriously talked about flying to the Moon was running the risk of a flying trip to the local mental asylum. High-performance fighter aircraft were striving to reach speeds of 400 mph. Radar was a secret known to only a handful of Englishmen. Penicillin, electron microscopes, television, nuclear weapons, the spread of cities *via* millions of automobiles, the genetic code, miniskirts and all the fashions and materials that we now take for granted—none of these existed.

And the popular wisdom—the

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most respected "experts" in every social and technical field of the day—*could not even envision these things.* Death rays? Miraculous pills that killed infections in hours? Living for weeks at a time at the bottom of the sea? Heart transplants? Silly, irrational, crazy.

With twenty-twenty hindsight, these same "experts" can trace the evolution of each of these great ideas back as far as Galileo, or Galen, or Glop the cave-dweller.

But you and I knew better. We could see men walking on the Moon, we knew that lasers would some day cut the toughest steels, that organ transplants or artificial organs would transform medical practice. We read all about it, here in Astounding/Analog.

And that's the single guiding principle behind this magazine. It's really quite simple: Analog is a forum of ideas. The stories, the articles, the editorials—all idea-based. Their intention is to provoke thought, to stimulate that complex interchange of neurons that rests inside the cranium.

Inevitably, the free play of ideas leads to clashes with the popular wisdom. And don't get the wrong idea: the popular wisdom is correct more often than not—usually because it can enforce its position and thus produce self-fulfilling prophecies. For example, at the moment the popular wisdom is preaching that a black man could not be elected to high national office—say, vice president. Of course not! Because the people who compose this popular bit of wisdom will not vote for a black man. Thus the popular wisdom is perfectly correct on that score.

In his editorials, and often in the stories and factual articles he selected, John Campbell ran afoul of the popular wisdom many times. Usually he did it deliberately, even though it sometimes led to personal abuse and misunderstanding.

Personal reminiscences are usually tedious, but John's attack on the popular wisdom was evident the first time I ever met him. It was in the lobby of the hotel that hosted the World Science Fiction Convention in 1963—in Washington, I think.

John was in the midst of insisting that 1963 marked the final year of American democracy. "No true democracy has lasted more than fifty years," he said very firmly, "and the United States became a true democracy in 1913."

Polite but puzzled stares from the crowd gathered around him.

"I've made that statement hundreds of times," John went on, "but only three people have understood what I mean by the 1913 date."

"Why, sir," I declaimed, "that's the year that direct popular election of U.S. Senators was put into effect. Prior to 1913, Senators were appointed by their state Governors."

"You're the fourth!" John beamed, and we were friends from then on.

Not that we didn't argue. To know

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John was to argue with him: faster-than-light travel, racial genetics, politics, economics, you-name-it. He wouldn't let you agree with him. He'd change the subject.

All right, where do we stand today, and where are we going?

Frankly, those of us in that hotel lobby smiled at John's prediction that American democracy was finished as of 1963. Maybe "snickered" is a better word. That was Labor Day weekend, less than three months before the assassination in Dallas. Democracy has been taking a beating hereabouts since then, it seems.

Is democracy doomed? Will the two-hundredth anniversary of our independence find that the great experiment in popular self-government has failed?

The popular wisdom is coming around to the position that we are indeed doomed. If pollution doesn't kill us, then overpopulation will reduce us all to starving serfs. Or the bombs will bloom fireballs.

Is the popular wisdom right? What are the alternatives? What happens next?

One of the most depressing aspects of today's popular cant is the attack on science and technology. The attack comes from high and low—from Congressman and Yippie alike. It is truly today's popular wisdom, and it goes something like this: Pollution is caused by automobiles and electric power stations and factories; therefore, if we get rid of these noxious machines, we will solve the pollution problem. Furthermore, tractors and insecticides and modern chemical fertilizers have led to an "ecological imbalance" and imperiled our streams, wildlife, and natural environment.

All very true. But if we get rid of the machines, and go back to "organic farming," we consign most of the world to starvation.

Well, the world's population is too high anyway. Getting rid of two or three billion people will make this planet a pleasant place to live in once again.

The assumption is, of course, that neither thee nor me will be among those to die. After all, we're good and true and beautiful. (Frankly, if you can sit by and let most of the people in the world die without a tingle of conscience, I'm not sure I'd want you for a neighbor.)

The simple truth is that if we stop our technology, we kill most of the people on this planet. A simple truth, but one that's hard to accept, difficult to reconcile with the popular wisdom.

Look at your friendly neighborhood power station: you can *see* the pollution belching out of its smokestacks! How can you stop it? Shut it down! Of course, that shuts off your supply of electricity. Which closes down most of the factories and computers and refrigerators that make your life possible. And if you stop automobiles, you'll have to find a job within walking distance of your bed.

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And you'll have to find food that grows just about that close, too.

Sure, it's pleasant to daydream about a bucolic world where man lives in harmony with nature, *a la* Thoreau. (Walden Pond is still a lovely spot; but even Thoreau could stand its lonely beauty for only two years.)

The trouble is, societies don't move backward through time, any more than a human being can reverse his aging process. We're not going back to A.D. 1800. In fact, if you did visit that era, chances are you'd run pell-mell back to the Twentieth Century. Those happy yeomen *worked* from dawn to dusk seven days a week, and died young.

If we can't go backward, what directions are open to us in the forward direction? There seems to be several possibilities.

We have an enormously powerful technology, and so far it has been asked only to do child's tricks: generate electricity, make various sorts of capital and consumer goods, transport people and cargo across the world and even to other planets. It's tempting to call today's technology a *first-generation* technology; that is, it has been aimed at doing simple, direct jobs without concerning itself about the consequences.

Up until very recently, we built electrical power stations to produce electricity. The fact that they also

continued on page 176

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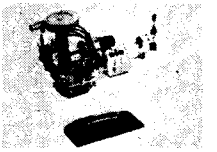

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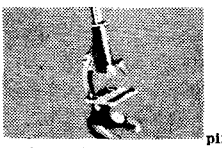

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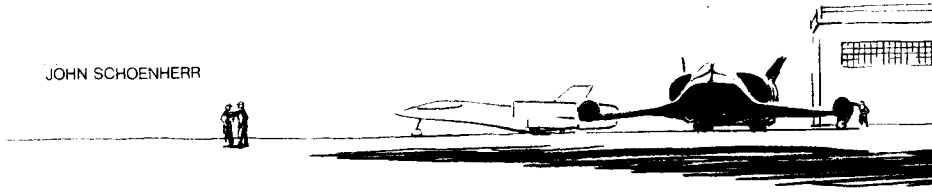

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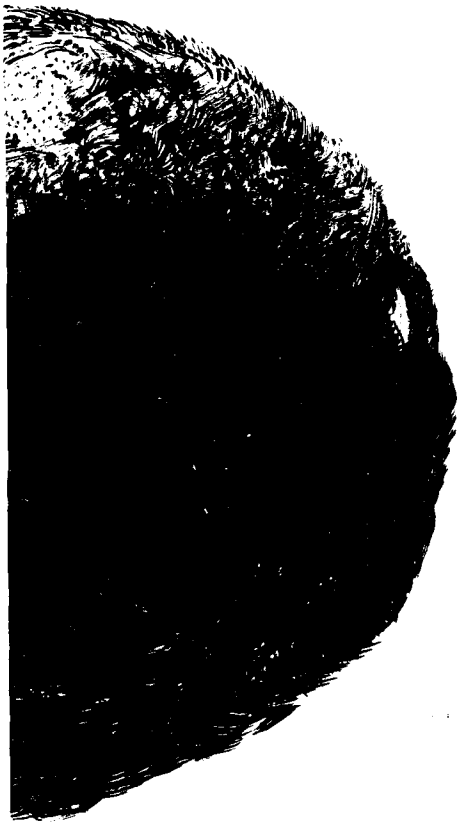
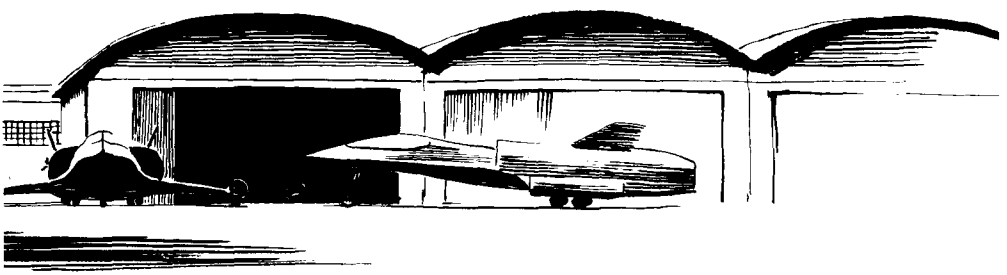
FIDO

True charity is among
the most laudable of emotions.
But suppose the recipient
doesn't want your help . . .

WILLIAM J. FROGGE





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I

The red telephone in the cubicle beside the desk rang. And rang. And rang. The sound cut dimly through the consciousness of the blue-uniformed figure sitting at the desk near the phone. Slowly, almost casually, the Air Force colonel put down the letter he was studying and turned to examine the offending instrument. A vague look of disquiet passed across his tanned features, the square jaw tightened, a frown caressed the broad brow, the blue eyes squinted slightly. His left hand reached out and picked up the phone, base and all. The right hand fastened tightly upon the connecting cord running from the phone base to the wall outlet, the left hand was gripped firmly upon the instrument and base together. Slowly, the hands began to move apart. The cord became taut. Suddenly there was a faint "pop" as the cord came loose from the base. The phone, which had continued to shrill its arbitrary commands, fell silent. The look of unease fell from the face of the officer. Carefully he replaced the silent phone in its cubicle and resumed his study of the letter he had earlier laid down. The Group Commander found his world to be once more a pleasant spot for undisturbed study. He was satisfied.

Across the road a half-mile away, in a steel and concrete complex buried beneath the ground, another red phone began ringing. The captain sitting before the plastic schematic of the base pulled his attention away from it and regarded the source of the clamorous intrusion mournfully. Keeping his gaze fixed steadily upon it, as if fearful that if he glanced away it would disappear, he fumbled in a desk drawer and pulled out a screwdriver. Turning the phone upside down, he slowly and carefully removed the cover from the base and studied the wiring for a moment. Then he placed the screwdriver under one of the terminals and slowly pried upward. The wire came loose, the phone fell silent. He replaced it and resumed his study of the schematic. Across the room, the sergeant who was carefully perusing a technical manual nodded his approval at the restored silence.

The Combat Operations Center of the Twenty-Third Air Force in Germany was two-tiered. On the lower deck, sat the operators of the computer consoles which connected the center with its European and Middle East bases. The far wall, forty feet high and two hundred feet wide, was occupied by a map covering northern Africa, Europe and most of the Soviet Union. Upon this map, the computers traced discreet symbols, each identifying the status of all known forces of allies, neutrals or possible enemies.

The upper tier, a balcony sloping downward to the lower tier, was reserved for the commanding general and the combat staff. Usually, as

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now, it was manned by a skeleton staff headed by a general officer. There was always a general officer in that center chair day and night, week in and week out, three hundred and sixty-five days of the year.

Today, that central console was manned by none other than Major General John N. Tichell, who commanded the Twenty-Third Air Force. Commanding generals do not normally pull "the duty," but General Tichell was an exception. He believed the Air Force dictum that its mission was to "fly and fight," and the next best thing to that was to practice. Other generals had become accustomed to the sight of that tall, spare, white-haired figure appearing at odd hours to either supersede them or, just as often, to sit quietly in a corner and observe.

"Smiling Jack" Tichell, so-called because he rarely let any emotion cross his aristocratic features, was something of a legend in the Air Force. Some men swore that his gray eyes, peering from beneath those white brows, could see through walls. The story had gained some credence after the day that he had uncovered a fifty-year supply of lime being hidden away by a base commander, during one of his frequent inspections. They'd been driving along the base perimeter, just the general and the base commander, when a small, deserted warehouse came into view. It seemed to catch the general's eye right away, and he'd evinced an immediate and unassailable desire to see the interior. After much fumbling and fussing, the supply officer had arrived with the keys, and when the building was opened, there it was. Lime. Tons and tons of lime.

Smiling Jack didn't fire the commander for the lime, that was the result of one of those mix-ups for which any huge organization, especially any huge military organization, was famous. Rather, he fired the commander for trying to hide it from him. His reasoning was devastatingly simple:

"Anyone who'd hide something picayune in peacetime might be tempted to hide something important in wartime. Generals fight battles based on information of their own and enemy forces. While data on the enemy may not always be what we'd like, there is no excuse for anything but complete and absolute accuracy as to our own capabilities."

Today, General Tichell was comfortably relaxed in the large, overstuffed chair behind his console. He'd just pulled a slender, black cigar from one corner of his thin lips when the computer intruded raucously.

"GROUP COMMANDER, RIPOSO AIR BASE, HAS FAILED TO ANSWER TWO-MINUTE RED PHONE CHECK. RIPOSO AIR BASE COMBAT OPERATIONS CENTER DOES NOT ANSWER RED PHONE. GROUP COMMANDER, RIPOSO AIR BASE, HAS FAILED—"

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The computer fell silent as General Tichell pushed a button on his console. A small, red, flashing light had suddenly appeared on the map in the northeastern corner of Italy, pinpointing the offending base.

A thin, but elegant, hand had reached out and speared the red phone on the console. "This is General Tichell. Get me the Group Operations officer at Riposo on the red phone. Also begin a check to Riposo through the 'long lines' system. Put in a call to General Bucom. Got that? Let me know in two minutes or less."

The other hand had also been active, while the first cradled the red phone. First, it had stabbed at the "Red Alert" button. Then, it had flicked a switch to bring the face of a console operator on the floor into view on the TV screen in the center of the console.

As the general dropped the red phone back into its cradle, he turned his attention to the screen. "Major, what do we have in the air which could reach Riposo the quickest?"

The major punched a series of buttons and studied the figures which began to march across the screen of his console. "There are two F-120s airborne over Bavaria with seventy minutes flying time remaining. By overflying neutral territory they can reach Riposo in about twenty minutes. If routed over France, thirty-five minutes."

Jack Tichell relapsed into thought for a moment. It was always ticklish when you violated someone's airspace. Both the Swiss and the Austrians were willing to be as friendly as circumstances permitted, but at the same time their military leaders got upset about such things and were likely to raise a fuss with the politicians, who would put the question to their diplomats, with the matter sometimes going all the way to the floor of the U. N. It wasn't that which decided him, though. As far as he was concerned, the Swiss and Austrians were professional neutrals whose safety and existence were guaranteed by the United States presence in Europe more than anything else, and behind this facade they positively delighted in exhibiting a "Holier than thou!" attitude of moral superiority—like the Swedes. Jack Tichell had little patience with such foolishness, and if he'd had a really solid reason, he'd have ignored the diplomatic niceties with aplomb. But he didn't really know anything yet.

"We'll route them over France, so arrange a clearance," he decided, "and then notify the commander that his planes are being switched to our control. Set up communications with the flight leader on scrambler and I'll brief him."

He switched his attention back to the console. Jack Tichell never bothered with redundant phrases like: "Got that?" It was up to his staff to be sure that they did get it, and if they didn't they weren't around long

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enough for it to matter. As he turned, the screen suddenly glowed to life, revealing a burly, beefy, red-faced, gray-haired figure wearing four stars on his uniform.

General Henry Taylor Bucom was the Commanding General of the United States Air Force in Europe; a man grim, determined, unimaginative, quick of temper and hard of head; withal he was also famed as of unquestioned courage and directness. Right now, he was also a man in his usual bad humor, a dominant trait.

"Damnit, Jack, if you've got to play soldier give me a little more warning," he roared into the screen. "Here I was two minutes from the golf course and that red phone begins to scream."

His listener didn't blink an eye. "No practice, General, We've lost contact with Riposo– Wait a minute. Their base operations red phone is ringing. Listen."

The phone rang a few times, then shut off.

"That's the way it is with all their phones, General. A few rings, then they shut off."

The anger disappeared from the florid face like smoke driven before the wind. He listened in silence as the other detailed the steps taken, and nodded his approval. "I'll put all of USAFE on alert and notify the Pentagon," he said quietly. "Keep me posted. Out."

The screen went blank.

Jack Tichell did not see, or affected not to see, the sighs of relief that went up when the terrible General Bucom's visage faded into grayness. He was otherwise occupied.

"Contact with flight leader, sir . . ."

It was a beautiful summer's day over Bavaria. The sky was a brilliant blue, a blue that made your heart sing with its purity, a blue that washed through the mind, cleansing and emptying it with its perfection. Seventy thousand feet below two speeding bright specks, the landscape flowed by, an admixture of greens, golds and browns dotted with white peasant cottages and, now and then, the spires and tiled roofs of villages. Occasionally the towers and walls of an ancient castle might flash brightly from a hilltop.

The occupants of the two bright specks far above were unconscious of the beauty of the moment. First, in their cockpits they could see the surface below only if they banked their planes. They admitted to themselves and to each other that it was a great day for flying, but that was the limit of their recognition.

The flight leader, Major George Rogers Dunn, better known as "Pappy" Dunn, had seen lots of beautiful flying days. Of course, he'd also seen some miserable ones, too. He took them as they came.

His nickname, Pappy, referred neither to his advanced age of twenty-nine, nor to any demonstrated virility, for Pappy was a confirmed bachelor. Rather, it referred

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to his habit of beginning even the most erudite tale with: "My pappy used to tell me . . ." Pappy's stories were famous in the Air Force, and his presence never failed to liven a dull evening at the club.

Few knew, or suspected, the secret which the tales concealed, a secret which only the closest study of his personnel records would reveal. Pappy Dunn was an orphan, a foundling, a deserted waif unclaimed and unwanted by either father or mother. The Air Force had become both to him, providing the companionship and perhaps a little of the love which he had missed growing up in an institution.

His wingman, "Joe-Boy" Wilson, was an altogether different cup of tea. Or glass of beer, perhaps, for if Joe-Boy ever drank anything weaker it had passed almost unnoticed. Scion of one of the oldest Boston families, heir to a respectable fortune, educated in the best Ivy League schools, Joe-Boy was less than a month out of advanced flight training and on his first assignment with a combat outfit. To say that he gloried in it would be putting it mildly. Joe-Boy hadn't yet had to fly through the miserable German weather of the fall, winter and spring months. He'd never felt the cold sweat that popped out on your brow when a brace of missiles went shooting past from behind, sure proof that an unfriendly type was on your tail and lining you up for a better shot.

In short, Joe-Boy was still an amateur; Pappy was a pro who had experienced all these things and more.

Pappy shifted his six-foot, four-inch length uncomfortably. They still built cockpits for the national average, which meant that anyone over five foot, ten was going to be crowded, and get even more crowded with each additional inch he took up. Actually, he thought to himself, if it wasn't for the parachute harness, the reserve chute, Mae West life jacket, survival gear, pressure suit, crash helmet and various other gear buckled onto him, he wouldn't be in too bad a shape.

Sometimes, he wished the Air Force put a little less stress on safety—in fact, most of the times. He'd had to bail out once, and by the time he's got free of the multitudinous straps which threatened to strangle him in mid-air, he was already on the ground—a hard landing. The fact that his jungle knife had become trapped under the straps and couldn't be got at to cut himself free did little to increase his appreciation for survival gear.

"ALPHA RED! ALPHA RED! THIS IS HOME PLATE. COME IN, ALPHA RED."

The sudden blare of the radio almost jerked him out of his seat.

"HOME PLATE, HOME PLATE. THIS IS ALPHA RED LEADER. OVER."

"ALPHA RED LEADER. YOU ARE SWITCHED TO CONTROL 'BIG DADDY'. I SAY AGAIN,

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YOU ARE SWITCHED TO CONTROL BIG DADDY. SWITCH TO BIG DADDY FREQUENCY AND USE SCRAMBLER CIRCUIT ONE SEVEN NINE. REPEAT. ONE SEVEN NINE. CONFIRM. OVER."

Pappy felt a cold chill run up and down his spine. Scrambler circuits were seldom used. When they were, it was a hint things were not going too well.

"ROGER, HOME PLATE. CONTROL SWITCHED TO BIG DADDY. CHANGE RADIO FREQUENCY AND SCRAMBLE ONE SEVEN NINE. OVER."

"ROGER, ALPHA RED LEADER. CONTACT BIG DADDY ON TERMINATION. OVER AND OUT."

"ROGER, HOME PLATE. OVER AND OUT."

As he began switching radio frequencies a tinny voice broke into his earphones.

"Hell, Pappy. Who's Big Daddy?"

He sighed to himself and the world at large. Joe-Boy was new, but not that new.

"Big Daddy," he said with more sharpness than usual, "is Twenty-third Air Force combat operations, as you would know if you'd studied ops orders a little more closely. Now, Joe-Boy, if you'll mind your manners and listen quietly, you shall see how a master pilot responds to his master's voice."

"HELLO, BIG DADDY. HELLO, BIG DADDY. THIS IS ALPHA RED LEADER. OVER."

His finger released the microphone button, and he waited. He didn't have to wait long.

"ALPHA RED LEADER, THIS IS BIG DADDY. DO YOU READ ME. OVER."

"BIG DADDY, I READ YOU LOUD AND CLEAR. OVER."

"ALPHA RED LEADER. YOUR MISSION IS SCRUBBED. YOU WILL SET COURSE FOR RIPOSO AIR BASE, ITALY OVERFLYING FRENCH TERRITORY. CLEARANCE BEING ARRANGED. YOU WILL MAKE NO CONTACT WITH GROUND STATIONS OR OTHER AIRCRAFT. YOU WILL OVERFLY RIPOSO AT FIFTY THOUSAND FEET REPEAT FIFTY THOUSAND AND REPORT. DO NOT LAND NOR DESCEND BELOW FIFTY THOUSAND WITHOUT PERMISSION. CONFIRM. OVER."

Report? Report what? Pappy shook his head vigorously to himself in a definite negative, while his voice spoke an affirmative into the microphone.

"ROGER, BIG DADDY. PROCEED RIPOSO VIA FRANCE. OVERFLY AT FIFTY THOUSAND FEET. NO COMMUNICATIONS AUTHORIZED. REPORT. OVER."

"ALPHA RED LEADER. THIS IS GENERAL TICHELL. OVER."

Pappy grunted to himself in relief. The chief in person. Maybe some enlightenment was coming his way.

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"ROGER, GENERAL. I READ YOU. OVER."

"WE DO NOT KNOW WHAT YOU WILL FIND AT RIPOSO. THE BASE DOES NOT ANSWER ANY ATTEMPTS TO CONTACT THEM BY RADIO OR TELEPHONE. REPORT ANYTHING THAT LOOKS OUT OF THE WAY. NOTE INDICATIONS OF NATURAL DISASTER OR UNFRIENDLY ACTION. ANY QUESTIONS? OVER."

"ROGER, GENERAL. NO QUESTIONS."

"BIG DADDY OVER AND OUT."

"ALPHA RED LEADER OVER AND OUT."

The silence which fell, unbroken except for course instructions from Pappy to his wingman, was absolutely deafening. With the Swiss Alps snowcapped peaks shining to port, they were winging smoothly across France before anyone spoke.

"Pappy, what's Riposo like?"

The "master pilot" smiled to himself. There were so many questions which Joe-Boy could have asked, most of which, embarrassingly enough, he could not answer, that he felt positively benign towards his young cohort.

"Riposo, my lad," he said breezily, "is north of Venice, and right alongside a seven thousand foot mountain which has a nasty habit of interfering with radar just when you need it the most. The town is big enough to put in your eye, but just barely. There are beautiful Italian signorinas, all of whom are guarded by their mamas more closely than the gold in Fort Knox, a fairly sizable Communist group in the nearest big town, and lots of real inexpensive wine. Good, too. We'll be there in another few minutes, so keep your eyes peeled and kindly shut up for a while."

Having reasserted his moral superiority and knowledge, Pappy relapsed into a pleased silence. It would be a while before Joe-Boy had a chance to ask any damaging questions now, and by that time Pappy might have some of the answers. For example, why would a base refuse to answer the telephone? Ordinarily, Pappy would have thought about things like big, mushroom-shaped clouds, but General Tichell had said there was no hint of enemy action. Sabotage was always a possibility, but that usually meant riots and peace marches and that sort of thing, none of which had been noticed.

He knew he was just kidding himself. Bases didn't refuse to answer their phones. It just didn't happen. That meant that whatever was wrong was bound to be out of the ordinary. Pappy felt vaguely uncomfortable; he always felt vaguely uncomfortable when things were out of the ordinary. Like the time that—

"How far now, Pappy?"

Joe-Boy again. He glanced at his instruments.

"ALPHA RED LEADER. THIS

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IS BIG DADDY. REPORT POSITION. OVER."

Somebody else thought it was about time he was earning his pay.

"BIG DADDY, THIS IS ALPHA RED LEADER. ALTITUDE FIFTY THOUSAND. APPROACHING RIPOSO. REDUCING SPEED TO ONE THOUSAND KNOTS. OVER."

"ROGER, ALPHA RED LEADER. REPORT CONTINUOUSLY. OVER."

That was just great, thought Pappy to himself glumly. If he was going to cut off communications like Riposo had, they wanted to know when. That made him wonder if they knew something about Riposo that they weren't telling him. Well, he'd soon know.

"ROGER, BIG DADDY. I CAN SEE THE APPROACH AND THE WESTERN END OF THE RUNWAY. OVER THE RUNWAY. EVERYTHING LOOKS NORMAL FROM UP HERE. NO SIGNS OF DAMAGE OR ODD ACTIVITY. PAST THE BASE NOW. BEGINNING LEFT BANK TO AVOID YUGOSLAV TERRITORY. OVER."

"ALPHA RED LEADER. THIS IS GENERAL TICHELL. DID YOU SEE ANYTHING AT ALL THAT WAS OUT OF THE WAY? OVER."

The general's voice sounded a bit strained to Pappy. Well it might, he thought to himself as his mind's eye again scanned the base.

"NO, SIR. NOTHING ODD EXCEPT– WAIT A MINUTE, GENERAL. THERE DIDN'T SEEM TO BE ANY ACTIVITY AT ALL, NOW THAT I THINK OF IT. YOU KNOW, NO CARS OR PEOPLE OR ANYTHING THAT I COULD SEE. OF COURSE, WE WERE PRETTY HIGH–"

"ALPHA RED LEADER. REDUCE SPEED AND DESCEND TO TWENTY-FIVE THOUSAND. MAKE ANOTHER PASS OVER THE BASE. CONFIRM. OVER."

"ROGER, BIG DADDY. REDUCING SPEED AND DESCENDING TO TWENTY-FIVE THOUSAND. NOW AT THIRTY-FIVE, THIRTY, TWENTY-FIVE THOUSAND. AIRSPEED FOUR HUNDRED KNOTS AND DROPPING. OVER."

Pappy didn't have to say any more. At four hundred knots, the F-120 had all the gliding characteristics of a rock about the size of the Empire State Building. A flame-out, or accident, and the pilot's chances of getting out would be just barely even. He continued his report.

"APPROACHING RIPOSO AT TWENTY-FIVE THOUSAND AND THREE SEVENTY-FIVE. EAST END OF RUNWAY IN SIGHT. NO SIGNS OF MOVEMENT ON BASE, ROADS, TOWN, ANYTHING. I CAN SEE VEHICLES. SOME HAVE STOPPED IN MIDDLE OF ROAD. NO MOVEMENT OF ANY KIND, INCREASING

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AIRSPEED . . . AIRSPEED . . . AIR . . ."

Pappy had been keeping his eye on his airspeed indicator. Now, as it dropped slightly, he pushed the throttle forward. The large dial seemed to expand before his eyes, reaching out for him. The needle moved upward so slowly it seemed to be pushing its way through a gelatin atmosphere. It was fascinating. Pappy felt the indefinable urge to study that indicator more closely, he could almost feel the air pressure against the needle, and the thrust of the mechanism as it drove the needle forward. Suddenly, he realized how little he knew about airspeed indicators; really knew about them, that is, rather than just use them.

"ALPHA RED LEADER. COME IN. ALPHA RED LEADER. COME IN. THIS IS BIG DADDY. COME IN, ALPHA RED LEADER. OVER."

The words cut through his consciousness like a knife. His eyes, still fixed on the airspeed indicator, saw that his airspeed was a comfortable twelve hundred knots. He glanced out the right side of the canopy, then craned his neck. He checked his mirrors for a better rear view. Joe-Boy was gone!

"ALPHA RED LEADER, REPORT! ALPHA RED LEADER, REPORT!"

The raucous voice in his earphones sounded desperate.

"BIG DADDY, THIS IS ALPHA RED LEADER." He fought to keep his voice calm and even, while he strove to understand what had happened to him. "WINGMAN NOT IN SIGHT. TURNING TO RETRACE COURSE. OVER."

"ALPHA RED LEADER, THIS IS GENERAL TICHELL."

Pappy grinned to himself. You could trust old Smiling Jack. He sounded about as excited as a wet poodle.

"ROGER, GENERAL."

"ASCEND AT ONCE TO FIFTY THOUSAND FEET." The voice was calm and incisive. Twenty-five thousand feet hadn't worked out too well, so they'd try again at the higher altitude. "MAKE ONE PASS OVER YOUR ROUTE IN SEARCH OF YOUR WINGMAN. WHETHER YOU SPOT HIM OR NOT, YOU WILL THEN SET COURSE FOR MILAN AIRPORT, REFUEL AND RETURN TO TWENTY-THIRD— NO. CANCEL THAT. YOU WILL PROCEED TO HEADQUARTERS USAFE AT WIESBADEN. CONFIRM. OVER."

"ROGER, SIR. ONE PASS AT FIFTY THOUSAND. REFUEL MILAN. FLY TO WIESBADEN. OVER."

"MAKE CONTINUOUS REPORTS. OVER."

"ROGER. AT FIFTY THOUSAND NOW. APPROACHING WEST END OF RUNWAY. WAIT A MINUTE! AIRCRAFT HAS LANDED AND ENGAGED BARRIER AT EAST END OF RUN-

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WAY. BELIEVE IT IS WINGMAN. NO DAMAGE TO AIRCRAFT VISIBLE FROM HERE. OVER."

"ROGER, ALPHA RED LEADER. MAKE NO FURTHER REPORTS. PROCEED AT ONCE TO MILAN AND REFUEL, THEN SET COURSE FOR WIESBADEN. OVER AND OUT."

"ALPHA RED LEADER. OVER AND OUT."

II

Pappy slouched down in the hard-backed chair at the far end of the mahogany table and wished he were some place else. Any place would do, as long as he could stretch out and sleep and sleep and sleep. His eyeballs felt like somebody had lightly sandpapered them, and every time he closed his eyes for a second, the irritation increased. His mouth was filled with a gummy white cotton mass, which made it hard to talk or swallow. He took another long swig of hot coffee from the paper cup at his right hand, and pulled his attention back to the conference. The USAFE staff had been wrangling for what seemed to be hours, although in reality he knew that less than ten minutes had passed since he entered the room.

To say that General Bucom was chairing the conference would be inexact. Rather, he was driving it grimly along the path he wished it to travel, and woe to the one who balked. At the moment, the Intelligence Office was taking its lumps.

"Fritz, does that damned computer of yours show anything unusual at Riposo in the last twenty-four hours?"

General Fritz Kreizler shook his bullet head. "Well, General, in this case its largely a matter of negative information. It shows no missiles, unidentified aircraft or other overt action has been directed—"

"That isn't what I asked you," General Bucom roared, slamming a fat fist down on the table. "Does it show *anything* unusual?"

"The computer is programmed to report missile tracks and targets, aircraft courses and identities, and so on," he said primly.

It was the wrong thing to say.

General Bucom smiled coldly. Rather, he lifted the corners of his lips and parted them to reveal two rows of even white teeth grinding across one another. Pappy saw several members of the staff brace themselves for a heavy wind.

"Wait a minute, Fritz. W-a-a-i-i-t just a minute." The voice had fallen several decibels and was deceptively soft. The staff members braced themselves again. "Supposing, just supposing, that last night a meteor weighing one million tons should decide to use the Riposo airstrip for a landing place? Or supposing that damned mountain should decide to slide down on top of the base. What would your computer say to that?"

"Nothing, General. It's not programmed for it."

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Now Pappy saw why the staff had braced itself—all but General Tichell. He was drinking it all in, digesting the information almost visibly, while ignoring all the pyrotechnics which went with it. Were going with it at the moment, for General Bucom had not taken kindly to the last bit of information from his Intelligence chief.

"Do you mean to tell me," the voice rose into a scream which echoed and re-echoed across the room, "that we could lose a base and that fifty million dollar pile of junk you call a computer wouldn't even notice it? If you tell me that, you're fired, and so is that piece of tin you call your 'electronic brain'."

Fritz Kreizler hastily retraced his verbal steps of a few moments before. "General, the computer has all the data on file, all we have to do is ask questions," he said soothingly.

The soothing tone had little effect. "Then get out of here and ask any questions you can think of," came the acid response, "and don't come back until you've got some answers."

Kreizler got.

Pappy had been feeling pretty sorry for the Intelligence chief, but as General Bucom's eyes swiveled towards him he began to transfer some of that pity closer to home.

"Now, Major Dunn, let's hear your story. What do they call you? Pappy? O.K., Pappy, start when you approached Riposo. Don't leave anything out, no matter how unimportant it may seem to you. Don't be embarrassed by it, either. As far as we know, you're the only man who kept his wits about him, and I think it's quite an achievement that what got your wingman didn't get you, too. Goes to show that it's the old heads in the Air Force who can be depended on when things get rough."

General Bucom was capable of a considerable amount of charm when he felt the occasion warranted it. Pappy felt himself expanding under the praise and the general's understanding manner.

He began to speak.

At the conclusion of his tale, they all sat silent for a few minutes.

General Tichell broke the short silence. "Even at twenty-five thousand it's not easy to notice details. Did you see anything at all moving around. A car? A man? A dog, even?"

"I might have missed something as small as a dog, sir, but I didn't see any activity of any kind. Nothing, sir."

The Chief of Operations was next. "How about your wingman. What kind of a pilot is he? Dependable, or one of these harum-scarum kids we get every once in a while? What's he like?"

"Lieutenant Wilson is a typical pilot for his age and experience. We all have to start somewhere, and he's made a good start so far. Not married, no responsibilities of any kind. A good pilot who'll get better. That's

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about all I can say about him, sir."

"All right, Jack, bring out the tape." General Bucom cut the discussion off sharply. A few moments later, a tape began playing the air-to-ground conversations and vice versa.

Pappy listened intently. While his responses might not be Academy award material, he felt that he'd held up his end. Then the tape came to the second pass over Riposo, the one at twenty-five thousand. Pappy felt his hair stand on end as he heard his own voice:

". . . AIRSPEED . . . AIRSPEED . . . AIR . . . WINGMAN . . . BREAKING . . . OFF . . . JOE-BOY . . . JOE . . . RE-FORM . . . JOE . . . COME . . . BACK . . . AIRSPEED . . . AIRSPEED—"

"I didn't say that, General. I don't remember a word of it. That's not me speaking! I went over the base and just blacked out, or something, but I didn't say anything. I swear it."

The tape had ended and they were all looking at him. An elderly officer with Medical Corps insignia began to speak softly.

"This may be important, or it may not. Two officers, two pilots, in a similar situation. One, experienced and mature, withstands whatever it was that affected the other, younger and less mature. It hits Major Dunn, all right, but he lets his reflexes take over. A Pavlovian response which young Lieutenant Wilson was unable to make."

Pappy didn't know too much about Pavlov, except that he'd studied dogs, so he wasn't sure whether he'd been insulted or complimented. In this circumstance, he maintained a sturdy silence.

The silence lasted longer than he'd expected, for the door of the conference room was ceremoniously opened and a young captain wearing the braid of a general's aide trod warily across the deep, plush carpeting. He moved like a ghost, and he was pale enough to pass for one. In his hand he held a yellow message form, upon which his gaze was fixed with the intensity a king cobra might have extracted, if it had been coiled around his arm. He extended the message to General Bucom without a word.

As the general's eyes flickered across the page, a tide of red began to flow up his neck, across his cheeks and into his stubby gray hair. Pappy was hypnotized by the sight. He'd often heard of people dying of apoplexy, but this was the first time he'd ever seen the symptoms. He expected General Bucom to explode into a brilliant flash of red color any second.

"Gentlemen," General Bucom was actually talking normally, Pappy noticed, "you will be overjoyed to know that after lo! these many years the United States Air Force in Europe has finally done something to merit the personal attention of such an exalted personage as the Secretary of Defense. Let me read the glad tidings, so that you can share with me this moment of joy."

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Pappy stared. Was this really General Bucom talking, he wondered? Then he noticed several of the staff members gripping the arms of their chairs tightly. Why! His thought processes were interrupted as the general began to read.

"FROM SECDEF FOR CG, USAFE. STP. ITALIAN MIN FOR AFF STATES OPS RIPOSO AB IMPEDING COMMERCE OF UDINE PROVINCE STP YOU WILL IMMEDIATELY SUSPEND OPS RIPOSO PENDING INVESTIGATION THIS SITUATION STP CRISIS EXTREMELY HARMFUL TO NATO STRUCTURE AS WELL AS U S FOR POLICY STP FULL REPORT WILL BE RENDERED MY OFFICE BY RETURN MESSAGE STP PENDING EVALUATION THIS REPORT, SECDEF RESERVES RIGHT TO AUTHORIZE RESUMPTION OPS AT RIPOSO STP SIGNED MACKEY."

General Bucom's mouth stretched in that horrible smile again, showing two rows of teeth grinding together at a fearful pace. Pappy wondered vaguely how often the dentist had to repair the damage.

"Doesn't it make you feel good to know that we have such brilliant and dedicated leadership in our civilian establishment, now?" The words were almost purred. "Imagine the Secretary of Defense going to all that trouble just for our benefit. I'm sure that we will all sleep better tonight, knowing that Secretary Mackey is watching over us, won't we, now?"

Then came the explosion. The staff members had braced themselves again, but Pappy had been lulled into a state of unpreparedness. He was almost blown out of his chair by the vehemence of the words.

"That stupid fool!" General Bucom screamed the words, pounding the table for emphasis at each one. "Doesn't he know that there's a worldwide alert on because of Riposo? Is it too much to ask that the Secretary of Defense attend the War Staff briefings of his own military chiefs? What's he doing in that puzzle palace, toadying up to all the Congressmen who want to come over for an inspection trip at the taxpayer's expense, so they can pick up some French perfume at cut rates? Can anybody be so ignorant as to believe that normal operations at an air base could possibly impede civilian commerce? That . . . that . . . that . . . ignoramus. That nincompoop. That—"

Only the entrance of General Kreizler, Pappy was sure, prevented at the very least a mild apopletic stroke. He, too, carried a piece of paper with him, but rather than a message form Pappy could see that it was a long sheet covered with computer printouts. While the sheet did not make him as completely unhappy as the captain had been, there was little doubt that it was not as welcome as a pay check, or even a Christmas card might have been.

"Well, well, well," said General

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Bucom sarcastically, "if it isn't Intelligence again. Tell me, Fritz, did your mechanized marvel cough up anything, or did you have to give it twenty lashes first?"

Kreizler chose to ignore the sarcasm. Everything considered, it was probably the wisest choice he had made all day. General Bucom was looking for a victim, and in his present frame of mind, there is little doubt that he did not really care who it was, just as long as he was within snarling range.

"General, the computer memory banks show that about twenty hours ago, a meteorite was picked up by the Ballastic Missile Early Warning site at Thule, Greenland. At least, we *think* it was a meteorite. After about ten seconds, it disappeared from the BMEW's screens, and was picked up a few minutes later by a similar site in England and, a little later, by the NATO radar coverage system. While flight characteristics were a little unstable, it seems to have been headed in the general direction of northern Italy." He paused uncertainly, then took the plunge. "The thing seemed to be able to match radar frequencies. It wasn't on any screen for more than ten seconds."

A dense silence fell on the group. It was pretty clear to Pappy that something General Kreizler had said was very important, but he wasn't sure just what it was. Radar frequencies could be matched? Well, so radar frequencies could be matched. So what? Science was always doing things like that, he supposed. He was glad to note that he wasn't the only one desiring clarification. Apparently General Bucom did, too.

"Let's put it in plain language, Fritz. You're talking about uncertain flight characteristics and matched frequencies. What does that mean in general, and how does it apply to Riposo in particular. In fact, does it mean anything at all, or are you just stumbling around in the dark?"

It was easy to see that General Bucom's bad humor had by no means completely disappeared, but at least he now had something he could get his teeth into, and he was going to hang on for all he was worth until he'd swallowed and digested it.

General Kreizler had a chance to expand and expound before the group, and he almost visibly swelled in importance as he took it. "I'll answer the last question first, General. Radar works by bouncing signals off a solid object and, from the echo this produces, showing a blip on the screen. The size of the object, its speed and trajectory or course can be estimated from a continuous signal being bounced back. Now, the experts in the field theorize that it is possible to construct a mechanism which would either absorb the signal complete, or divert it. In either case, the result would be the same. Now, this 'thing' *may* have done something like that. It was on the screens ten seconds, when it should have been on ten minutes or more. After ten

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seconds, as far as the radar screens were concerned, it didn't exist. It was invisible, it—"

The interruption was harsh. "Do you mean to tell me that something could be visible to our radar, and that . . . that"—General Bucom was visibly searching for the word which would express his utter contempt for the Intelligence computer—"that . . . multi-million dollar MONSTROSITY"—he failed—"that machine of yours didn't notice it?" He ground his teeth in renewed fury.

"We've started re-programming so it'll pick them up in the future, General. It's all a matter of telling it what you want. The information is there, all we need do is tell the computer to sort it out." General Kreizler hurried on, hoping to turn the attention of his chief to other matters. "Now, to the flight characteristics. Most meteorites burn up in the atmosphere because they're going too fast. This one came in pretty slowly for some reason or other, and it slowed down faster than normal. Over BMEW it was doing a couple of thousand miles an hour; over Europe it had slowed down to less than half that speed. The trajectory was a little erratic, but that might have been caused by its tumbling through the air."

During the past few minutes, Jack Tichell had been sitting back taking it all in. Now, Pappy saw that he'd reached some kind of a conclusion, for he leaned forward and rather negligently raised a thin hand. "Tell me, Fritz, is there any indication that this thing landed at Riposo, or is causing the problem there?"

Fritz Kreizler brightened visibly. "No, Jack. We don't even know if it came down within a hundred miles of Riposo."

"How big was it?"

"Maybe a hundred feet long, and a quarter of that in diameter." Intelligence was glad to be asked questions it could answer.

"To sum up, then, we've got a weird natural phenomenom which may, or may not, have affected Riposo. The one fact we have is that something is badly wrong at Riposo, the effects are not confined to the base, and the causes are unknown." Jack looked directly at General Bucom, then glanced at Pappy. "I think we need more information."

Pappy quailed inwardly. The connection of himself to "more information" was clear to everyone in the room. Pappy saw several glances of sympathy from the staff, and one or two of pity.

Pity and sympathy were noticeably lacking from General Bucom's look. "I think you're right, Jack. Pappy, you're the only man in the Command who has had any personal experience with the Riposo situation—except for those who right now can't tell us anything—and you've shown that you can take whatever it dishes out and come back for more. Therefore, you're the logical man to carry out an investigation in the field. You can have my personal plane and crew, and I'll

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call the Army commander at Vicenza and arrange for him to give you anything you want. Get over to Riposo and get us some answers!"

III

Northern Italy is beautiful in the summertime. The grass and trees are a deep emerald green, the fields are covered with greens and golds and browns. White-stuccoed houses with red tile roofs dot the countryside; the towns and villages are filled to overflowing with happy natives and tourists, with a sprinkling of the colorful uniforms of Army troops and gendarmes. The golden beaches of the Adriatic coast are inundated by bikini-clad visitors, and the cash registers in the tourist shops ring merrily all day long.

In some ways, the road to Riposo was typical. The well-tended fields promised bumper crops, the red-roofed houses were numerous and suitably quaint, the macadam road stretched out between fields and houses towards the foothills of the Alps. There the resemblance ended.

Military trucks and tanks were jammed up for a half mile, stretching forward to a point where a rope barrier had been erected. On the near side of the rope, all was confusion, bustle, movement. On the other side of the rope there was an unusual, even eerie, stillness. There were cars and people on that far side of the rope, but the cars were stopped in the middle of the road with drivers sitting in them yet, while the few people in view seemed to be in a state of paralysis.

Pappy noted this glumly as he wended his way forward. He was not in the mood for beautiful Italian afternoons. His day had begun at 4:00 a.m., when he got up to prepare for a routine training flight. Since then he'd made one flight to Italy, a return trip to Germany, attended an exhausting conference, been flown back to Italy, and had then endured a hair-raising, ninety-mile dash cross-country, preceded by two Italian motorcycle cops who seemed determined to hurl themselves and him to destruction as they raced around hairpin turns at top speed and wove through traffic as if it didn't exist. Pappy was convinced that, likable as the Italians were, when it came to highway driving they were all more than a little mad.

Ahead of him, he could see a fairly large group of what he assumed were Italian officers, a sprinkling of Air Force blue uniforms, and a real chef's salad of troops and gendarmes. Some of the uniforms were strange to Pappy, but he recognized the *Bersaglieri, Alpini* and *Carbinieri* uniforms, at least. The latter represented Italian logic at its fullest. An Italian drinking acquaintance had once assured him, when he made one of his infrequent stops at Riposo, that Italy was one country which was guaranteed against a Communist putsch. Why? Because the Communists always

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tried first to gain control of the Ministry of the Interior and, through it, the secret police. In the Italian case, this was the *Carbinieri.* But Italy, he was assured, had taken out an insurance policy against such a take-over. They had *two* secret police outfits; the other, run by the army, kept tabs on the *Carbinieri* as well as their other duties, while the forces of the Ministry of the Interior spied just as enthusiastically on the Army to prevent a military dictatorship. Whatever else you might say against the system, so far it seemed to have worked.

"Buon giorno, signor maggiore."

Pappy started as he realized the words were directed at him. He looked appealingly at the Army interpreter they'd given him.

"He says, 'Good day, Major.' "

"Tell him 'hello' for me, and see what you can find out about what's going on."

The Italian began to tumble back and forth in torrents. After a few minutes, he began to wonder if he'd have been better off asking direct questions. After a few more, he was sure he would have. A little later, he was getting ready to put theory into practice, when the, to him, interminable conversation came to an end.

"He says nobody knows what's going on, Major."

That was a big help. Did it take ten minutes, he wondered, to get a simple answer to a simple question like that? If it did, he was going to be here for a long time.

The interpreter began to expand his earlier remark. "There's a spot about sixteen kilometers in diameter, centered on Riposo, where nothing at all is happening. People don't move, talk, or answer telephones. Troops who were sent in to investigate went fifty or a hundred meters, then they seemed to go into a trance–like the others. The troops are here to keep anyone else from wandering in, as much as anything else. He says the Italian government thinks it's the Americans' doings, an experiment or something that went wrong, and they want it stopped. Right now. That's all, sir."

Pappy groaned to himself. What did they expect him to do, wave a magic wand like the prince in the story, or did he kiss the sleeping princess–well, no matter, he decided. Looking around, he saw that the friendly Italians didn't look nearly as friendly as he remembered them from the past. Better get out that magic wand.

There were a few friendly faces. Those wearing the Air Force blue. Now one of them pushed his way forward. A senior master sergeant, he saw, and from those ribbons a veteran of nearly twenty years service, though his coffee-brown face didn't look to be over forty, if that. The sergeant saluted.

"Sergeant Chambley, sir. Base sergeant major. Me and a few of the other boys were caught outside when

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the thing closed up. Some of us have families in there—I do myself. The Eyteties seem to think Riposo had something to do with this, but I know better. Me and the boys,"—he gestured to the other half dozen Air Force men—"are volunteers if you need anything done. How about it, sir?"

"Not just yet, Sergeant Chambley. Maybe you'll get your chance later." He said it as kindly as he could, at the same time cursing to himself. He'd forgotten that the men at Riposo had their families. There must be five or six hundred American families in there, as well as the base personnel and the local population.

A few feet away an Army corporal had been busily setting up all kinds of meters and gauges, turning them on and off, adjusting, checking and taking readings. Now the corporal turned to Pappy and shook his head disgustedly.

"Nothing at all, sir. No signs of gas, radiation, anything. The whole thing stinks to high heaven. It just ain't normal. If someone has dreamed up a ray gun or something, it doesn't show on what I've got."

Pappy hadn't really expected anything, so he wasn't disappointed. The Italians had "black boxes" and men to handle them, too, and they hadn't had any better luck. Well, it was time to try the old "Pappy Dunn special."

"Strap me in, boys."

The Army men crowded around him. They'd rehearsed this a couple of times back at Vicenza before leaving, and they had it down pat. Quickly, a parachute harness was strapped in place, but with one important variation. The harness was put on backwards, sans parachute, with all the releases and catches of the harness wired closed. Even if Pappy were double-jointed and had the free use of a pair of wirecutters, it would take him some time to get out of the rig which was being wrapped around him. Then two separate cables, one of rope and the other of wire, were fastened to the parachute rigging at two separate points. It might look undignified; Pappy was sure that it did. But it was the best thing he'd been able to think of on short notice.

"Now remember," he instructed his handlers, "after five minutes you reel me back in if I don't come back by myself."

They nodded in unison.

Pappy put on the gas mask the Army had rigged up for him at Vicenza. It really wasn't a gas mask at all, of course, but a modified scuba diving rig with an attachment which covered his whole face like a conventional mask would. Since there was no sign of gas or radiation, there really wasn't any good reason to wear the thing, but he might as well be as sure and safe as possible. He was ready.

He nodded to the handlers; they nodded back. He turned and walked across the low-strung wire which

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marked the end of the safety zone, and strode out into the field. He could hear the dry grass swishing against his boots as he walked. Except for the thudding of his own heart, that was the only sound which broke the heavy silence.

He came to where the Italian soldiers stood. One, he saw, was looking towards the distant mountains. Pappy moved a hand in front of his eyes and got no more response than if the man had been a statue. Another was looking at the ground, squatting down. Pappy followed his gaze to—a daisy. The man was looking at a common, white-and-yellow, field variety daisy. He shook his head to himself. Something was sure screwy here.

Just then he felt a sharp tug which almost overbalanced him. He looked

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over his shoulder in surprise. The Army boys, he saw, were preparing to reel him in like a trout. He waved to them and started back. Five minutes had never passed more quickly.

When he got back, everybody was looking at him like he had two heads. Then suddenly one of the Italian soldiers shouted, "Bravo!" In another second, the whole group had taken it up. Pappy stood there feeling more than a little foolish, wishing that they would knock it off. After a few minutes which seemed like hours to him, they did. By that time, he didn't really care.

The Army had patched up a radio link with USAFE, and Pappy was trying to explain, above the uproar around him, just what had happened to him in the field. The trouble was, nothing at all had happened, which

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made it hard to describe to anyone, no matter how many stars they had on their shoulders. The answers came through loud and clear. The gas mask was a protective device. The Army would start making up more of them. In the meantime, Pappy was to take the one he had and get in there and find out what was wrong. Roger? Roger.

He was about to finish off the rather one-sided conversation with General Bucom—all conversations with General Bucom were usually one-sided—when the whole thing went to pieces.

"Hey, you! Stop!"

"Grab him, somebody!"

"Don't go—"

Intermingled with these yells were the shouts of the Italians. Pappy knew that something was not going well and when he looked up over the radio on the tailgate of the truck, he saw what it was. An Air Force sergeant, who looked suspiciously like the base sergeant major he'd been talking to a while ago, had started out into the field. It was a little hard to really tell, for the man's face was covered—with Pappy's gas mask. The air tank dangled over one shoulder. The sergeant was marching steadily and purposefully through the grass, and Pappy knew, with a sudden sickening feeling, that he was headed for his family some five miles to the north. The sergeant was going home.

Then suddenly the sergeant wasn't going anywhere anymore. He'd passed the Italian soldiers and was walking along like he hadn't a care in the world, when suddenly he seemed to be wading through thick molasses. One foot came up slowly, so slowly, and was set down in front of the other. The other foot came up even more slowly, but when it was put down it was like the sergeant was planting it permanently upon the earth. The other foot did not rise. The sergeant stood frozen in place, staring hopelessly towards the mountains.

Pappy felt a surge of dismay, but at the same time a glimmer of understanding ran through him. He turned back to the radio, pressed the "Talk" button and began. Of course the gas mask hadn't worked for the sergeant. It hadn't really worked for him, either, he explained. And it wouldn't work for anyone else so they might as well scrap the whole idea of making gas masks. Why? Simple when you thought about it for a moment. When he and Joe-Boy had descended to overfly Riposo so long ago—less than twelve hours, but it seemed like eternity to Pappy—they'd been on oxygen. The air was very thin at twenty-five thousand feet, let alone at seventy thousand or so. In short, they'd been in their own perfectly isolated environment. Yet Joe-Boy had fallen into the trap. That seemed to show pretty clearly, in conjunction with the Army man's tests, that what they were up against wasn't a gas or any airborne infection.

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The logic seemed inescapable to Pappy. It also seemed unarguable to the other end of the line. After a few moments. General Bucom came on the loudspeaker. He was now quite reasonable. Pappy was to test his theory by going into the field sans gas mask but with the ropes still tied on. He was to seek for volunteers, to see if anyone else was immune. He was to use his own judgment as to how far he would carry his investigations.

Volunteers just weren't. Not after what had happened to Sergeant Chambley. And after Pappy had made his second successful trip into the zone, he wasn't bothered with cheers anymore. He knew what they were thinking when one of the Italian soldiers made the sign of the evil eye. It got worse after a nonvolunteer was sent out in the harness and dragged back after a few minutes. When he got back, he remained in his comatose state, staring helplessly and unseeingly into space.

He got back on the radiophone. "I'm going to have them patch the car radio through this set to Vicenza and USAFE," he said quietly, "and then I'm going to get in the car and drive to the base. The thing seems to be centered there, and if I can find it maybe I can turn it off, or do something to stop it. It's the only idea I have. If anybody has any that are better, let me know."

He'd never talked to a general like this before in his entire life. Of course, he admitted hastily to himself, he didn't often talk to generals anyway. Still and all, so far the generals hadn't come up with much, so maybe he could do better following his own ideas. The generals seemed to think so, too. Pappy got his O.K.

"I am driving towards the base at twenty-five miles an hour," he reported as he drove along, "and everything looks perfectly normal except for a general lack of movement. Now approaching the compound of the Italian armored division on the southern edge of the base. No activity. Passing the compound and approaching western end of the runway. Wait a minute. Want to investigate something."

When Pappy got back into the car, he was perspiring, but it was the cold sweat of fear and shock. "General, listen closely. There is a bird sitting by the roadside—and not moving. It has a worm in its beak—and the worm's not moving. *But* the worm is just as shiny and fat as if it'd just been pulled out of the ground."

"Pappy, this is General Tichell. General Bucom is listening, too. What are you trying to say?"

"Ever go fishing with worms, General? I have. A worm that's been out in the sun a little while shrivels right up. Yet this must have started hours ago, but that worm hasn't been affected in the least by an entire day in the hot sun. General, it's against nature."

"Good work, Pappy," General Bucom cut into the conversation quickly, "but now we've got some-

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thing for you. We've pinpointed the center of the problem, and it seems to lie just to the north of the center hangar maybe a hundred yards. We've got a schematic of the base before us, and we're going to conn you in. The main gate is on your left. Turn into it and take the bypass road which runs along the north fence. You're on it? Good. Now follow the fence past base ops. The road will bend up towards the hangars in less than a mile. Let me know what you see."

Pappy was hoping against hope that he wouldn't see anything, or find anything. He was hoping that whatever it was would quietly get up and walk, run, crawl or fly to the nearest exit. But as he drove along, the feeling grew within him that it was going to be easy to find. Too easy. It was just sitting there like a big, fat spider waiting for one George Rogers Dunn to stroll stupidly into its parlor. Right at the moment, he felt as stupid–

The building to his left had screened the hangar, but now at the far end of the yellow stucco finish something dark and ominous began to emerge into his line of sight. As the car moved along, more and more of the thing hove into view. Pappy began to think it was endless. He was practically hypnotized by its size. The damn thing must be a hundred feet long, he thought, and it stood twelve feet high if it was an inch. No, he corrected himself, twelve feet of it was showing above the level of the ground. From its size, about that much must have sunk into the ground.

"I've found it," he said softly into the microphone.

"Good work, Pappy," General Tichell's voice sounded tinny and far away. "What is it? Describe it to us."

"It looks like a rock, General. A big, cylindrical, overgrown, black and brown rock. It's maybe a hundred feet long or so, and I'd guess that it's maybe a quarter of that in diameter. It's sitting there as if it were perfectly at home. Not so much as a blade of grass disturbed around it."

"I get you, Pappy."

General Tichell turned to General Bucom and switched off the "Talk" button. "Did you get that point, General? Pappy is telling us that that rock, or whatever it is, didn't hit the ground like a meteor should. It landed itself. I'm going to tell him to get out of there while the getting's good. Do you concur, General?"

General Bucom nodded his assent. He wasn't worrying about Pappy at all at this moment. Rather, he was thinking of ways and means to drop a one megaton bomb on a hundred-foot rock without killing a lot of innocent bystanders. It was a difficult problem, and as yet he wasn't even close to a solution. In the background, he heard Jack relaying new orders to Pappy, but he paid no attention at first as he wrestled with his own problem. Then he heard Pappy's response to the order to cut out.

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"I'm mighty sorry, General, but I can't do that just yet."

General Bucom's cup of woe was running over. A base had closed down, he'd got a hiding from the Secretary of Defense, an international ruckus had been stirred up, and now a major was telling a major general "No!" The world was running wild, and he intended to stop it right now. He snatched the microphone from Jack Tichell and roared into it: "What do you mean, you can't? You shut up and do as you're told or—"

"Shut up, Hank." The voice was cold, incisive, insistent. Silence fell.

In the car, Pappy wrote down in his mental book of Things That Have Happened to Me Once: Heard a two-star tell a four-star to shut up. And he did. It made him feel good all over. Then he thought about the cause of the interruption, and he didn't feel good at all anymore.

"Now, Pappy," General Tichell's voice was soothing, "suppose you tell us why you can't come back now. Is something wrong?"

Is something wrong? Pappy felt a wave of bitterness flood through his veins. This was a day which had seen everything go wrong, and he didn't expect it to end any better. His shoulders slumped in dejected resignation. He knew what he was going to do, what he had to do—

"Yes, sir. Something is very wrong. That rock is alive. And it knows that I'm here. And it wants to talk to me. Over and out."

IV

At least, this conference was smaller than the last one. It consisted of just three men: General Bucom, General Tichell and Major George Rogers Dunn. The setting was different, too.

General Bucom's office wasn't as big as a ballroom. It just looked that way. At the far end, louvered windows stretched from above the floor to the twelve-foot high ceiling. Delicate scrollwork traced patterns against the panes. Golden damask draperies bordered the windows, providing a shimmering contrast to the dark-green walls. When you walked across the rug, you seemed to sink ankle-deep into the brown and tan and gold floral patterns. The top of the dark oak desk behind which General Bucom sat was four feet wide and six feet long. Its satin finish glowed with the reflected light of the morning sun streaming through the windows. Overstuffed chairs, two similar sofas, a conference table and a dozen wooden chairs, and several end tables and ashtray stands completed the furnishings. Generals did not stand short on the good things in life, especially when the taxpayers paid for them.

Pappy and Jack Tichell had drawn their easy chairs up to the overhanging desk top, and Pappy leaned back in the chair and watched as General Tichell himself poured cof-

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fee from a silver service sitting on the far end of the desk. For a moment Pappy felt guilty at being served coffee by a two-star general, then he leaned back and decided to enjoy the experience. What the hell, he thought, I earned it. He'd had a good night's sleep at Vicenza, a whole six hours of it, then had napped on the flight back to Germany. He felt like a different man. Not a new man. Just a different one. He hoped that feeling would go away soon and leave him in peace, but somehow or other he doubted it.

"Well, Pappy, it worked out just like you said. Everybody woke up, the base is back to normal, the Italian government is happy, Secretary Mackey is happy, General Tichell is happy, and I'm happy. That's quite a parlay no matter how you look at it. But if that damned rock is alive, it sure hasn't talked to anyone else yet to prove it. Jack Daniels, the base commander at Riposo, is having a fit and wants to blow the thing up, and I'm not sure I wouldn't like to, too. But let's hear your story. What did it do to them? What is it? A spaceship?"

Pappy shook his head sideways. "It's a funny story, sir. I've only got part of it myself, and I don't understand what I do have, either. I guess that basically you'd say that it isn't a machine, or a spaceship, or anything like that. Or if it is, it isn't like any machine we ever heard of. It can travel through space, all right, but that's the way it's built. Its body . . . if that's the right word . . . is built to travel through space."

"Well, if it travels through space it's a spaceship for my money." General Bucom was not easily sidetracked from his pet theories.

"Maybe so, sir." Pappy was carefully noncommittal. "It doesn't seem to understand the word 'machine' the way we use it, but that doesn't mean it isn't one, I guess."

General Bucom, mollified, was once again the charm-school product.

"Pappy, you did a fine job out there, one that deserves a medal, and you're going to get one if I have my way." Since four-star generals are famous for getting their way, Pappy knew the medal was a sure thing. "But before we go off on any more tangents, there's one thing I'd like to get cleared up. That thing closed Riposo down tight as a drum. Tighter! Hell, the place was sealed off like a casket. Now, if it's going to run around doing things like that very often, I hope that we can divert its attention to the Russkies, or the Chicoms, or somebody like that. What the hell was it doing there? Just trying to attract our attention?"

Pappy grinned weakly. "It was . . . helping us, sir. No, maybe that's not the right word. Improvement. That's better. It was improving us."

"Helping us? Improving us?" The charm-school manner flew to the four winds. "That kind of help—or improvement, or whatever you want

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to call it—that kind of help I can do without."

"Let me explain, General. Did you ever concentrate on a problem, I mean really concentrate, trying to understand all the ramifications of it? Sure you did. We all do. Everybody does. A bird concentrates on catching a worm. I concentrate on flying a jet. You concentrate on the problems of running the command. Colonel Daniels was concentrating on reading a letter, for example. Well, it was improving their ability to concentrate so completely that every possible factor would be understood."

General Bucom became, if anything, even more obdurate. "Jack Daniels spends a whole day concentrating on a single letter? I don't believe it."

It was Jack Tichell who got down to fundamentals again. Pappy's respect for the white-haired general went up considerably in the next few seconds.

"If it says that it was improving us, let's take that for granted for the time being, General. We can always hash it out later. I've got two pretty basic questions, though, Pappy," he added, turning his attention away from the stolid figure behind the desk, "and I'd like some straight answers to them, too."

Pappy stiffened slightly, imperceptibly. He had an idea he wasn't going to like the questions, and that the two generals weren't going to like the answers, either. Sadly, he looked down at the floor, hoping that it would open up and swallow him. It didn't.

"First, how come it didn't set about improving you? How come you were immune?"

Pappy had to concentrate to avoid the grin of relief he felt. Maybe he was home free after all.

"Partly pure chance, sir," he responded cheerfully. "When I flew through its 'sphere of influence' I didn't concentrate on any one thing long enough for it to catch me. It almost did when I looked at the altimeter for a split second too long, but then I flew out of range. Its range is rather limited."

He took a deep breath.

"Then, when I crossed that field, it 'recognized' me again. It would, of course. Things weren't going as well with its improvement program as it hoped they would and it decided it needed a little more information. When it found out there were billions of us here on Earth, it decided to change its tactics. I don't know how many people it could work on at one time, but apparently the sheer numbers of people—"

General Tichell broke in quickly at that point. "That brings me right to the nub of my next question, Pappy. Next several questions, as a matter of fact.

"First, just what does this improvement consist of?

"Second, why is it doing it?

"Third—No, I'll save that for later."

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"Improvement? Why?" Pappy was marshaling his words behind the facade of momentary indecision. Maybe he wasn't home free after all. "Well, sir, the first question is pretty simple in a kind of way. Human beings have all kinds of physical and mental faculties, but they don't really use them at full power very often. You know, you've heard about the man trapped in the burning truck who was saved when somebody ripped the door off its hinges with his bare hands. Or the man who worked on a mathematical theory to the point of exhaustion and then dreamed the answer in his sleep. Well, it says that we can do things like that all the time when we're—integrated."

He paused, then hurried on as he saw General Tichell studying him carefully. "As to the 'why'? Well, that's what it's supposed to do, that's its function. It works at—improving things."

"Very good, Pappy," General Tichell applauded verbally, "and quite neatly put. But that raises another question. The use of the terms 'function' and 'work' seems to imply a—foreman, shall we say—who assigns tasks. And who maybe drops by a little later to see that they have been satisfactorily handled, hm-m-m?"

Pappy could see the direction General Tichell's thoughts were taking, and he could see that General Bucom was more than a mite receptive to the hint.

Alien invasion! Prepare to serve the Master Race now that our servant has taught you your place in the universe.

Another few words from General Tichell, and General Bucom would be all ready to order the immediate destruction of the visitor from the stars—Pappy saw his hand inching towards that red telephone—and would then prepare to fight off the BEMs.

Pappy hastened to head them off at the pass.

"No. No, sir. Not the way you're thinking. Really not, General. Let me explain." The words chased one another out.

Jack Tichell nodded and relaxed in his chair ever so lightly, and after a moment General Bucom followed his example, at the same time keeping his one hand close to that red phone. Pappy plunged on.

"You see, sir, it's all a kind of accident. I mean, it came here by accident." He stopped. "No, that isn't quite true, either. You see—"

General Tichell waved a thin, elegant hand in gentle remonstrance. "Pappy, suppose I ask direct questions and you answer them as best you can. O. K.?"

Pappy nodded.

"Good. Now, was it sent here by anybody, or anything?"

"No, sir."

"How did it pick this planet to land on?"

"Accident. Random chance."

"Better and better. Now, does

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anybody, or anything, off this planet know that it's here?"

Pappy didn't think it was going better at all. He didn't like the direction the questions were taking, and he didn't like the way General Bucom's hand was petting that red phone affectionately, while a particularly nasty smile crossed his face.

"Well, Pappy, how about it?" General Tichell demanded harshly. "Do they, or don't they?"

Pappy shook his head sadly from side to side. "No, sir, nobody or nothing knows it's here."

General Bucom's smile grew even broader as he picked up the phone he had been fondling the last few minutes. "Better and best," he grated raucously, "and I'm going to make sure that nobody or nothing finds out that it is, or has been here. Right now. Get me–"

His voice broke off as a thin finger pushed down the button which disconnected the phone. "Jack, get the hell–"

Jack Tichell broke off the torrent of invective with a few quick words. "General, I wouldn't do anything hasty until the President, or at least the Secretary of Defense, has had his say. They might see things in a different light."

The thick, puffy fingers tightened on the phone as if it were a throat from which he was slowly squeezing the life, while the general's face reddened and then slowly reverted to its normal color. He nodded. "You're right again, Jack. After this is over we'll get off a message. Now that it's quit 'improving' us we can afford to spend a little time on it first."

Pappy wondered vaguely just how General Bucom proposed to "spend a little time" with their visitor. In fact, how did you go about using a rubber hose on a rock twenty-five feet in diameter and over a hundred feet long. It certainly posed a few nice probabilities.

"Ah, yes. Improving us. That reminds me, Pappy," General Tichell almost purred the words, "My last question, for the time being: *Has* it quit trying to improve us? Permanently? Once and for all? Well?"

Pappy saw that he wasn't home free at all. He was out by a country mile. He tried to find the right words, couldn't, and shrugged mentally. *What the hell,* he thought bitterly to himself, *they're generals. Let them figure it out.*

He shook his head negatively once again. "No, sir. It's just decided to change its tactics. Don't ask me what the change involves or what it's going to do, because I haven't the slightest idea. But it intends to go ahead and perform its primary function. It's going to improve us."

Both the generals were taken aback by the blunt reply, but Jack Tichell rallied strongly.

"Suppose . . . just suppose, Pappy . . . that we don't want to be improved? Suppose that we want to stay just the way we are? No changes. No frills. Just plain, old hu-

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man beings, bumbling along as best we can. What then?"

Pappy's voice was flat and even. "That's too bad, General."

"You mean, it's going to improve us whether we want it or not?"

The reply was in the same monotone. "That's right, General. Whether we want it or not."

Jack Tichell was still standing by the desk his hand on the red phone. His fingers drummed upon it once, twice. Then he made up his mind.

"I think, General, that now would be a good time to advise higher headquarters and get some guidance."

General Bucom nodded agreement. He'd known all along that it would come to this. But instead of picking up the red phone he turned first to an ordinary one and dialed quickly.

"Operations? General Bucom. Give me Ops Intelligence. Hello. General Bucom here. I want a code name for a classified operation . . . That thing at Riposo . . . Yes, Top Secret. What's that? Is that the best you can do? Oh, it's next on the list. O.K. Assign it and advise Riposo to use it on all communications regarding that . . . that *thing* they've got down there. Tell 'em to classify and encrypt everything on it."

He didn't bother saying good-bye, he just slammed down the receiver. "Fido," he growled, "that's the code name they gave me. Fido!" Then he visibly mellowed as a memory came crowding in. "I used to have a dog named 'Fido,' you know. Finest little mongrel mutt you could ever hope to see. Always wagging his tail—Ha!"

His voice cut off abruptly. Embarrassment? From General Bucom? Pappy thought he liked him better after the brief display of human emotion.

The general was back at work with a vengeance. He had a yellow, legal-sized tablet before him, and upon the top sheet he was hurriedly scrawling words. Minutes passed as he gave free rein to his thoughts, then he seemed to stop in mid-career, scratched out a word or two and substituted new ones and passed the completed draft to Jack Tichell.

General Tichell read it without comment and passed it on to Pappy. He wondered why, but when he read the message he knew. This was "share the responsibility" day.

TOP SECRET. FOR SECDEF FROM CG USAFE. THIS MESSAGE IN FIVE PARTS. PART ONE. CODE NAME FIDO RPT QUOTE FIDO UNQUOTE ASSIGNED TO CAUSE DISRUPTION OF ACTIVITIES VICINITY OF RIPOSO AB. PART TWO. FIDO IS ALIEN APPROX ONE HUNDRED FEET LONG AND TWENTY-FIVE FEET DIAMETER. RESEMBLES METEORITE IN APPEARANCE. NO DATA ON OTHER MENTAL OR PHYSICAL CHARACTERISTICS AVAILABLE. PART THREE. CREATURE DISRUPTED ACTIVITY RIPOSO

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AREA IN ATTEMPT TO MODIFY SLASH CHANGE SLASH IMPROVE LIVING CREATURES WITHIN SPHERE OF INFLUENCE. PART FOUR. ALIEN HAS ANNOUNCED INTENTION TO CONTINUE EFFORTS TO MODIFY HUMAN BEINGS. METHOD AND GOALS NOT KNOWN. PART FIVE. TO PREVENT FURTHER DAMAGE INTERNATIONAL RELATIONS AND NATO STRUCTURE, AND TO SAFEGUARD HUMAN RACE, RECOMMEND IMMEDIATE DESTRUCTION OF FIDO. REQUEST PERMISSION BY RETURN MESSAGE. SIGNED BUCOM.

Pappy reread the message carefully. There wasn't anything really untrue in what General Bucom was saying, but the way he was phrasing things didn't seem very fair. He looked up at General Tichell, searching for a little moral support in the arguments he was going to make, but that worthy shook his head gently from side to side.

"Pappy," he said softly, "it may seem a little unjust to condemn our friend from outer space, but we just can't let him go around deciding what to change and what not to change and then doing it without so much as a 'by your leave.' "

Pappy shrugged and initialed the draft. Ten minutes later he was dismissed and twenty minutes later he was in a nice, hot shower preparatory to a solid twelve hours of sleep, rest and relaxation. It was tough on Fido, he thought morosely as he crawled into the cot in the room he'd been assigned, but things were tough all over. Better luck next time. Besides, Pappy Dunn rather liked himself just as he was.

V

The bed was shaking. Pappy groaned softly and burrowed deeper into the sheets, trying to hold it still. The shaking persisted, but now it was transferred to his body. He felt something thumping against his shoulder.

"Wake up, Major Dunn! Wake up. Major Dunn. General Bucom wants to see you, sir."

Pappy tried to shut out the noise and the thumping, but it was no use. Wearily he attempted to open his eyes and found that he lacked the strength for even that simple task. He groaned loudly, while one hand slowly pried loose first one gummed eyelid then the other. The sunlight streaming through the windows was blinding. He closed his eyes again and fell back into the bed. The shaking and the pleading voice resumed immediately.

"Major Dunn, you've got to get up. The general wants to see you. Right now, sir. Right now!"

There was no help for it. He opened his eyes and looked at the fatigue-clad figure beside his bed. A young sergeant wearing the badge of

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the Security Police. Security Police? Suddenly Pappy was wide-awake.

He turned and looked at the clock beside the bed. Either he'd slept two hours and seventeen minutes or twenty-six hours and seventeen minutes. He didn't need anyone to tell him which one it was.

Now, why would General Bucom send the Security Police for him? A simple call to the Charge of Quarters would have sufficed. He looked distastefully at the rumpled uniform he'd worn for the last two days, then shrugged. If General Bucom wanted to see him, he'd just have to take what Pappy had to wear. Too bad.

While he struggled into the clothes, he wondered dully why the general was sending for him at all. Less than three hours ago all their problems had been neatly resolved in that outgoing message. As soon as the reply came back, Fido would be "put to sleep"—he wondered just how that was going to be arranged—and the world would revert to normal.

He considered asking the young sergeant, then decided against it. Young sergeants had an amazing amount of knowledge, he knew, but this was one subject on which no one knew very much and he doubted that the grapevine had yet told anything he didn't already know himself. When he stumbled out the door of the building, he found out that there were several things he didn't know.

A good round dozen Security Policemen were there and they were fully occupied. Behind their lines was a throng of civilians. Civilians? Pappy looked closely and blinked rapidly. These weren't civilians; they were newsmen. A babble of voices carried to him.

"Major Dunn! Major Dunn! What did the alien say to you?"

"A statement! Say something to the American public!"

"International Telenews will pay a million dollars for an exclusive interview!"

That caught Pappy's attention. What did he know that was worth a million dollars to anybody? Answer: nothing.

Flashbulbs were popping right and left, blinding him. The voices became shriller and more angry in tone.

"The taxpayers have a right to know."

"What's the public going to think—?"

Pappy was pushed and pulled through the crowd into the back door of an armored personnel carrier. As the door closed and the voices dimmed, he collapsed onto the bench running along one side of the APC and stared. More guards. And a white-haired full colonel who smiled sympathetically.

"Colonel Dinsmore. Command Director of Information. You'll get a chance to meet the press a little later, Pappy."

"I don't want to meet the press," he replied sullenly, "all I want is to

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get back to bed and sleep. Preferably for the rest of my life, but I'll settle for twelve hours. Or eight hours."

He sighed sadly.

"What does General Bucom want, Colonel? Or don't you know?"

Nothing like a little rudeness to get a response. The colonel stiffened and for a second Pappy thought he'd misjudged him, but then he relaxed again and came out with one of those toothpaste commercial smiles that seemed to mark all Information people.

"Now, Major Dunn," Pappy noticed that he suddenly wasn't 'Pappy' anymore, "all in good time. General Bucom will answer all your questions, I'm sure."

That was a neat way of saying that he didn't know, Pappy said to himself. *That's bad. When Information doesn't know, it's because the party line hasn't been decided on yet. Wonder what–*

His ruminations were cut off as the APC came to a halt and the door was opened. Pappy looked around curiously. No question where he was. The underground entrance to USAFE headquarters. If he'd had any doubts, the star-bedecked cars parked here resolved them.

A minute later, after a ride up in General Bucom's private elevator, he was again "in conference."

There was General Tichell in the same chair, as if he'd never left the room. Maybe he hadn't, come to think of it. Pappy peered closely. Somehow General Tichell didn't seem quite as assured and composed. Or was it his imagination?

Pappy transferred his gaze to General Bucom. The heavy-set figure seemed to sit stiffly in the chair behind the desk; the features were tight and–Pappy looked more closely–General Bucom looked . . . scared? General Bucom? Pappy felt a chill run up and down his spine.

"This is Major Dunn. He spoke with the thing."

At the words, a figure arose from the chair Pappy had earlier occupied. He hadn't noticed that someone was in it because its back was to him. It was a very high-backed chair.

"Afternoon, Major Dunn. I'm Charles Adams, adviser to the President and in this case the President's personal representative on 'Fido.' "

"Mr. Adams," Jack Tichell interposed dryly, "has complete and absolute authority on all matters relating to–Fido." He paused, smiled briefly, and went on. "That includes the matter of Fido's disposition, communication with him, public announcements relating–"

"Yes," the dark, saturnine figure interrupted quickly, "and that brings up a point. There appears to be a large number of newsmen who know, if not everything, at least a great deal. Air Force security seems to have been a little lax–"

CRASH! General Bucom's fist hit the desk with enough force to drive it through the floor.

"*Mr.* Adams," he snarled, drawl-

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ing out the "Mr." as insultingly as he could, "it may have escaped your notice, but there were some twenty-five thousand people in Fido's control yesterday. Absolutely paralyzed. Add to that some tens of thousands of troops and police, curious crowds, the fact that the Italian government just barely managed to notice that activity had come to a complete halt in an area some seventy-five square miles, plus the fact that uncounted thousands of people saw Major Dunn go in, the only man immune to that control, and that after he went in the paralysis was broken, and you might conceivably have something which would arouse the interest of the world press."

"And I'll add for your benefit," General Tichell added coldly, "that I have personally checked the movements of Major Dunn and can confirm that he has done nothing more harmful to Air Force security than try to get a little sleep. Very little, I might add."

Him? Pappy stared. Him? He was going to get the blame for that shouting, gesticulating mob outside his quarters? He—

"I beg the pardon of all concerned." Charles Adams backtracked hurriedly. "Early information is often erroneous, or subject to misconstruction." He changed the subject quickly. "I understand that Major Dunn is the only man who has—conversed, shall we say—with our visitor, Fido. Fido! Surely a more apt name could have been found."

Pappy looked Mr. Charles Adams over very carefully. The President's hatchetman, he was called in Washington, and he had earned the sobriquet several times over. He wasn't very impressive close-up. Five-ten, one hundred seventy pounds, dark straight hair combed straight back, thin-faced with a stupid-looking, heavy handlebar moustache bisecting his features—Pappy wondered sometimes about the current craze towards hirsuteness—and dark, gleaming eyes. He wondered if the gleam was natural, or came from contact lenses.

"Satisfied, Major Dunn?"

He started. Charles Adams had noticed the intent scrutiny.

"Sorry, Mr. Adams," he mumbled, "but—"

The White House envoy waved a hand negligently.

"Forget it, Major Dunn. Now, let's get down to business. I want to know everything that happened, everything you said and everything that was said to you during your visit with Fido."

Once again, Pappy went through the whole thing. Then again. And again. After the second re-telling of the tale, Charles Adams began his cross-examination.

Where was he from? Outer space. Yes, but where in particular? He didn't say and I didn't ask. He arrived here by accident? Yes. Random chance. What kind of improvement was he undertaking when he

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froze all those people? He didn't say. Was he successful in improving them? Probably not, because he said he'd have to use some other method. What kind of other method? He didn't say.

Round and round. Back and forth. Over and under. Again and again. Then suddenly something new was interjected into the questioning.

It was General Tichell who did it. "You know, gentlemen, we're forgetting something that I meant to ask earlier and nobody has covered so far. Tell me, Pappy, just how does a rock go about talking to you?"

"Why, he just . . . just talks, sir."

"How, Pappy? How? Does he have a microphone, a loudspeaker, a voice box of some kind? How do you hear him?"

The look of consternation on every face except Jack Tichell's showed that he had scored heavily with his question. Pappy's face was no exception. He frowned and thought about it for several minutes.

"Well, sir, I couldn't say that I heard him through my ears, if you know what I mean, but the words were there plain as day. That's all."

"Mental telepathy, by God! It's got to be. Mental control of others. Mental communication. How else could he do it?" Charles Adams's look at General Tichell was filled with more respect. "A key question, General." He switched his attention over to General Bucom. "And you wish to wantonly destroy not only the first extraterrestrial visitor to Earth, but one who has perhaps mastered all the mysteries of the mind."

"And I still want to." General Bucom refused to be impressed either by the rank or the arguments of his distinguished visitor. "If he can control twenty-five thousand people plus animals and insects all at one time, who can say what else he can do, or how powerful he is? I say blast him!"

Adams smiled primly, "My instructions are to avoid any damage to Fido unless there is a 'clear, immediate and present danger' to the planet."

"Yes, and by the time you find how 'immediate and present' the danger is, it'll be too late to do anything about it."

"Gentlemen, I realize that I must seem extraordinarily—opposed—to pure military arguments. There are several good reasons for my position." He smiled, and for a minute seemed more human for it. "You see, the situation is very involved. Let me explain some of the considerations.

"As General Bucom so aptly put it, the activities of Fido have aroused a fair amount of interest. This interest is not restricted to just the press, although God knows that's bad enough.

"We have a problem with the Italian government, for example. While we occupy and use Riposo Air Base exclusively, Italy retains ownership and all rights of sovereignty over it. Fido fell on their soil, and they have

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stated, through diplomatic channels, a claim to it.

"The USSR has also contacted the administration. Where they got their information I don't know. Probably from some highly placed Reds in the Italian government. In any case, they have demanded that the 'extra-territorial visitor'—their term, not mine—be internationalized under the U.N. They would, since he fell on our side of the Iron Curtain. Fat chance we'd have if he fell on their side!"

He paused.

"Then the affair is also of greater, or lesser, interest to the governments of Nato countries, the Far East and other world regions. We must act rapidly if the interests of the United States are not to be submerged beneath the growing pressure."

He stopped, smiled and looked straight at Major George Rogers Dunn. "I am sure that all these problems can be overcome. Don't you agree, Major?"

"Yes, sir." What else could you say to a question like that? But Pappy wished he would look in some other direction instead of directly at him. "I'm sure you'll be able to work it out—"

"Not 'you,' Major. *WE!* We will work something out."

Pappy looked around for help. We? Not him! In things like this, "we" succeeded, or "I" succeeded, but "you" failed. Fall Guy Rogers! To hell with that. He started to rise—

And sank back in the chair at a wave of General Bucom's hand. "Sorry about this, Pappy, but you've been detailed to assist Mr. Adams for as long as he needs you. You're his Project Officer on Project Fido."

The hatchetman gave him a wintry, sardonic smile. "Do not fear, Major," he remarked with a trace of a sneer, "*I* will take full responsibility for the success, or failure, of our tasks. Since there are only two major items, you should be back flying your pretty airplanes within a week or two at the most." The sneer was even more pronounced as he uttered the last phrase.

It didn't set too well with either of the generals, nor with Pappy.

"What are these two simple, little jobs which *you* are taking responsibility for?" Pappy returned the sneer with a little interest, and noticed that he had the full moral support of both General Bucom and General Tichell in his efforts.

Charles Adams chose to ignore the tone and to concentrate on the words.

"Well, first of all, Major, Fido has to be convinced that it is in his best interests as well as ours to defer—shall we say—any attempt to 'improve' us until we decide on the direction said improvement should take."

He was lecturing to them now.

"I am sure that this will not be too difficult a task, not nearly so difficult as you gentlemen seem, by your expressions, to infer. Fido is, from

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what Major Dunn has said, an intelligent and rational creature. A simple appeal to logic, presented by a mind trained in that art"—his tone made it clear that, fortunately for them, such a mind was to be found in this very room—" should suffice. At the same time, a number of rather basic questions, which have so far not been posed, will give us a much better idea of the capabilities and limitations of our guest."

For the first time, Pappy smiled. "I'll be glad to handle the introductions, Mr. Adams," he said cheerfully, "but from then on, you're on your own." He hesitated, then decided to press on. "And just what is the second minor task?" He pushed the needle in hard.

"Ah, yes. The second task." Their VIP smiled happily. "The second task should prove most interesting." He was savoring it now, enjoying it to the full.

The three military men looked at each other. Civilian VIPs were bad enough, but when one was as pleasant as this one, something was in the wind. Adams waited a moment or two, milking the moments of their flavor.

"The President has decided that Fido is extremely important to the United States and the world." That was no surprise to anybody. "He has, therefore, directed that he be transported to the continental U.S. forthwith. Immediately. At the soonest."

Pappy felt his eyebrows trying desperately to crawl up to meet his hairline. Transport Fido! Fido? A rock that big must weigh thousands of tons! On solid ground he had sunk in ten to twelve feet. On a road, maybe he'd only sink in five or six feet, while if he was loaded on a railroad flatcar the car, tracks and roadbed would be well underground the minute he was laid upon them. That is, assuming that you could find a way to pick him up in the first place. An aircraft was just out of the question, of course. The plane wasn't made that would carry him. He could see that the two generals agreed with his estimate of the situation.

"You're crazy!" That was General Bucom, right to the point. "I don't know what that thing weighs, but I'll bet you have to cut him up before you can move him, and I don't think he'll like that too well."

General Tichell's point was equally well-taken. "Assuming that you can and do pick him up—let's say on a specially constructed truck bed with solid tires for a starter—there is one little item you've maybe overlooked. If the Italian government claims Fido, I don't think they're going to let you move him to the United States by either road or rail, and there isn't an airplane in the world strong enough to carry such a load. And if there were, moving him would cause an international incident."

"Gentlemen! Gentlemen!" Adams had decided that things had gone far enough. "Gentlemen, my words

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were purposefully ill-chosen. Misleading, even. I expected the objections you have raised. In fact, I deliberately invited them so that you could appreciate the plan which I propose to follow."

He was in high fettle now, draining every drop of exhilaration from his forthcoming triumph.

"You may recall that Fido, both upon entering the atmosphere and upon landing at Riposo, clearly showed a considerable degree of control over his movements. In fact, as Major Dunn so aptly expressed it, he landed without so much as disturbing a blade of grass. The conclusion is inescapable.

"Fido can provide his own power to move from spot to spot! This relegates the two major problems to oblivion. First, we don't have to move him, for he will move himself. Secondly, since we didn't move him, but he moved of his own accord, neither the Italian government nor any other nation can blame the United States for his movements. If he chooses to transport himself to maybe White Sands or some such spot, that is his affair. Criticisms?"

Pappy gritted his teeth. Adams had probably come up with a plan which would not only work, but which would work so as to absolve the U.S. of any blame in the matter.

"Maybe Fido likes it where he is," he argued weakly.

"Nonsense! A rational approach is all that is required."

So ordered. At Adams insistence, Fido was isolated from the public until he and Pappy arrived. Security was to prevent communication as well as any attempt at destruction. A plane was to be readied to transport them to Riposo. Pappy left to get breakfast. Or lunch. Or something to eat.

VI

It was still mid-afternoon when he got back from the Officer's Club. The inner man had been satisfied by a small steak, medium rare, a baked potato with sour cream dressing, a tossed salad smothered in Roquefort and innumerable cups of hot, black coffee. Physically he was content, mentally he was resigned.

He nodded to the general's secretary, a bleached but young and extremely curvy blonde. She smiled back at him hesitantly.

"I'll buzz the general and see if he's in, Major."

Buzz the general and see if he's in? Pappy froze in place, one foot half-lifted, his hand reaching for the doorknob. He knew that the general was in, but if he wasn't in to one George Rogers Dunn, then said George Rogers Dunn was in some kind of trouble. He thought back, trying to isolate something that he might have said or done to render him persona non grata. No luck. Too many things had happened. Any one of them—

"The general says for you to come in, Major," the secretary said, giving

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him another smile, "but watch out. He's not in one of his better moods."

He appreciated the warning, though he didn't know that General Bucom *had* better moods. He nodded his thanks and opened the door.

All three of them were still in the room, which was turning a faint blue from General Tichell's cigar smoke. As he watched, the general was lighting up another of his evil-looking, thin black cigars. Mr. Adams was contributing to the air pollution with a heavy, curved briar pipe. General Bucom, proof that he indeed was not in one of his better moods, was contenting himself with intermittent streams of sulphurous invective.

He listened carefully as he closed the door. Traitor, renegade and turncoat, or variations, were the terms most frequently included in the general's display of his command of the English language. Pappy hoped that they weren't being applied to him. His mind was quickly put at rest.

"Well, Pappy," General Bucom returned quickly to the pose of an officer in command of himself and the situation. "you're off the hook. Project Fido has just been canceled."

Pappy felt like dancing a jig, but carefully controlled himself. "Well, sir, I'm sure that there are more qualified officers–" he said humbly.

"Oh, there're lots of officers in the Air Force," Charles Adams cut in quickly and sarcastically, "most of whom have little idea of what their duty is and even less of how to perform it. Your selection was made solely due to the fact that you had–conversed–with Fido. The little you learned from him didn't redound to your credit, but it was better than nothing. But since Fido is no longer there to be moved, your part in moving him is automatically erased. Is that clear to you?"

What'd he mean, Fido was no longer there to be moved? He looked to General Tichell for explanation.

"What everybody is saying, in so many words," that worthy stated calmly, "is that Mr. Adams's theory of Fido's locomotive power was correct and has borne fruit. Fido lifted off about twenty-five minutes ago, and when last seen by the search plane had crossed the Yugoslavian border and was headed for Russia. Radar tracked him to the Black Sea area, where he descended until contact was lost. Fido appears to have defected."

"A damned Commie-lover–" General Bucom was off and running again.

"The President's orders–" Charles Adams had his own problems.

"Fido can turn the balance of power in the world. In fact, I might even say that he has already done so." Trust General Tichell to sum it up quickly.

Pappy stumbled over to one of the sofas along the wall and sat down heavily. His thoughts were swimming turgidly under the impact of the news. Fido was gone! A renegade.

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Wait a minute. Pappy froze as he traced that thought. A renegade? Fido hadn't signed up for the duration with the U.S. Air Force or anybody else that he was aware of. Besides, he didn't seem to evince any interest in politics at all, as far as Pappy could recall. And what was that bit about radar and descending—?

Unbidden thoughts rose to the surface of his mind. Clear thoughts. Rational thoughts. Logical thoughts. He felt as if he were on a straight oxygen diet; it was as if the ideas were coming to him from nowhere. Or somewhere? For a second he felt a cold chill at the uninvited thought, then he pushed it aside for later consideration.

He got up from the sofa and walked along the wall to a point where he could face the other three.

"Let's not be carried away by surface appearances," he interrupted calmly. "Your first conclusions are quite incorrect."

General Bucom, cut off in the middle of a sentence of unusual pungency, stared at him. The other two joined in that stare, but Pappy was momentarily disturbed by the gleam of cold calculation in Jack Tichell's face. There was a man who, once he began to think, would delve and pry—

Pappy shrugged mentally. He had their attention. That was all that mattered at the moment.

"Fido has changed his location, and because of the direction we have assumed that he has also transferred his allegiance. Since he never stated any allegiance to us, the use of the word 'changed' has no meaning. And neither does the fact that he moved, or the direction he took. I'll wager a month's pay right now that the direction is merely a continuation of the course he was on when he first came in for a landing. Am I right?"

A glance at the generals indicated that the course was pretty close and as General Bucom picked up the phone and began to issue orders for a check he knew that he had them for the moment.

"Now, when Fido moved he told us something. Several things.

"First, he told us that he wasn't willing to be subject to our control. Right?

"Second, he told us that he wasn't willing to be subjected to anybody's control."

"I'll concede the first, but you'll have to prove the second." Charles Adams had found his voice again.

"I will. Simple, too. When Fido first appeared, he was capable of matching radar frequencies"—Pappy remembered the term from the first conference, and was inordinately proud of it—"and disappearing from our screens at will. But now, he takes off and radar tracks him all the way to the Black Sea. Ten minutes? Twenty minutes? Then he descends and is lost from the screens.

"Fido is saying, 'I am not willing to be controlled by you. I am showing you that I am not going over to

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the control of anybody else. I am submerging below the level of the Black Sea.' And I'll bet that he submerged at a point which is equidistant from the shores of any of the powers which border the Black Sea. How about it?"

Once again, he saw that he'd scored a hit. Sure, it'd take some checking to be exact, but he *knew* that Fido had placed himself in a pretty secure position.

Underwater sonar would find it impossible to distinguish one rock from another. He would be too deep for aircraft to see him. He'd be at a place where the claims and interests of Russia, Turkey, Bulgaria and Romania would come pretty close to intersecting. And, Pappy thought, if things got sticky for any reason he could always move again.

He looked around the room. General Bucom, he saw, was more than satisfied with his explanation.

Mr. Charles Adams was already framing his report to the President. A report, Pappy suspected, which would gloss over Fido's disappearance and any real, or suspected, failures of the writer, and would not spare the Air Force for letting Fido get away before Charles Adams had had a chance to get him on a leash.

General Tichell was carefully turning the thing over in his mind, and as he saw Pappy's glance he nodded his general agreement.

"Then that settles it!" Charles Adams wanted to start writing that report right now.

"Not quite," Pappy interposed quietly. He was going to enjoy this. "Full Responsibility" Adams was going to get his fill of it right now. "You've forgotten the first part of Project Fido."

The frown of concentration on the presidential adviser's face lasted for several seconds. For some reason, Pappy was pleased to see that General Tichell got it first. He waited patiently as comprehension dawned on all three faces.

"I see you remember now. Fido said he was going to 'improve' the human race. He never said he was going to give up, just change his methods.

"I wonder what he has in mind?" ■

Astronomers . . . seek to investigate
the true constitution of the universe—
the most important and most admirable
problem that there is.

GALILEO GALILEI

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GENESIS 500

Before we can say "God Is Dead" we must define just what is meant by the term "God". For a primitive people it's a simple, primitive term—and very real!

ROBERT F. YOUNG

KELLY FREAS

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Hunting down a superbeing is like driving in that ancient superchariot race they used to call the "Indianapolis 500". The only time those drivers were really alive was when they were on the track. That's the way it is with us. The only time we're *really alive is when we're on the trail of an ogre, a dragon or a god.*

—Harry Westwood

Starbrook brought the airfarer in on a near-horizontal plane, keeping it well below the height of the taller trees and landing it neatly in a pleasant meadow not far from the Mesa's southern edge. Since ∫(.(./ did not expect company, it was unlikely that the deity would be watching the skies; but Starbrook had learned long ago not to take chances on superbeing hunts. It was late in the day, but the sun had not yet set and the meadow was golden with late-afternoon sunlight. Starbrook had told the members of the Planet Preparatory Team that he could reach the Mesa before nightfall, and he had been right.

He made maximum use of the sunlight while it lasted, canopying the area with a repulsifield, erecting his tent and unloading his provisions. He took advantage of the afterglow to open a self-heating container of beans and a self-heating container of coffee; he ate squatting on his haunches in front of the tent, gazing across the meadow to the woodland that lay beyond.

By the time he finished eating, the last of the light was gone and the darkness was complete. He stood up and threw the two containers into the tall meadow grass. The face of night was pimpled with stars, only one of which he recognized. Even this was not a true star, but the sister planet of the one upon which he stood. Both planets had unpronounceable names, and the PPTeam had renamed them. The one upon which Starbrook stood they had christened "Love," the other, "Light."

When the starlight became bright enough to see by, Starbrook went over to the airfarer and got the transmissifield projector out of the cargo compartment. Rummaging through the cockpit, he found his V/ii5 goggles, and put them on. Instantly the pale luminescence cast by the stars turned into a grayish murk and the stars themselves took on the aspect of orange peels. However, the murk did not hide one tenth as many details as the starlight did, and he had an eidetic map to augment it. The original of the map was a multi-magnified orbital photo belonging to the PPTeam.

His repulsifier unit was already attached to his belt, and he turned it on. The field it generated enveloped him at a mean distance of three quarters of an inch and was a miniversion of the repulsifield that canopied the camp. Although both fields provided protection from direct attack, their primary purpose in the present instance was to ground thun-

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derbolts. Thunderbolts were standard weaponry for primitive gods like ⌈(.(./, and he could be counted upon to use them for two reasons: (1) under ordinary circumstances they could be relied upon to turn an interloper into a cinder; and (2) like most such deities, ⌈(.(./ was handicapped by his own divinity and considered physical contact with a mere mortal demeaning.

Starbrook grimaced as the field needled his nerve-ends. He waited till he grew accustomed to it; then, carrying the projector, he crossed the meadow—the smaller field nullified the larger one long enough for him to pass through it—and entered the woodland. To his left, he knew, the terrain dropped gradually to form one slope of a shallow cwm; to his right lay higher ground. He maintained as straight a course as the trees would allow, and at length he came to a gravelly plain. Beyond the plain a range of rocky hills showed.

Before leaving the woodland, he spent several minutes studying the terrain and listening to the night noises. The terrain told him nothing he didn't already know, and the night noises were the ones little animals make in their pursuits of and flights from one another. When he started across the plain, the hills seemed to creep out of the grayish murk to meet him. Beyond them, he knew, lay a large garden, and beyond the garden, flanked on the north by a thick forest, the idyllic hinterland that constituted ⌈(.(./'s demesne. The map in Starbrook's mind showed the deity as well as his demesne. He was lying Jehovah-like on a grassy hillside, his huge and shaggy head supported by a slablike hand which in turn was supported by a columnlike forearm.

Starbrook reached the hills without incident. They were like the ruins of ancient buildings. Entering them, he made his way to the ones nearest the garden and began searching for a pass. Presently he found one. It was more than wide enough for a superbeing of ⌈(.(./'s dimensions to walk through, and it led directly into the garden. Climbing halfway up the eastern slope, he cut a shelf for the projector and set the unit in place, anchoring it with a pair of self-driving spikes provided for the purpose. After ascertaining that it was correctly positioned, he turned it on.

The transmissifield that the unit generated and projected crosswise into the pass was invisible, but Starbrook knew it had gone into effect because the feedback rendered the projector invisible also. In a few moments the field would join hands with the receivifield that had already been set up on Light, and anyone passing through the former would be atomically disassembled and projected to the latter, there to be reassembled and to emerge in a new milieu.

The trap was set. In the morning, Starbrook would bait it.

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His nocturnal task completed, he lingered on the hillside. He knew that he should be starting back to camp so that he could get a good night's sleep, for the stratagem he had decided upon after the PPTeam had briefed him on ʃ(.(./ involved considerable physical labor. But he was curious about the garden that lay beyond the hills. The upper slopes of the hill he had climbed halfway were treacherous, and he was hesitant about climbing higher. Perhaps if he descended and made his way eastward, he would find another pass.

He found one a quarter of an hour later. It was narrower than the first one, and he had to climb a rocky slope to reach it. He walked halfway down a similar slope on the other side. The garden lay below him. There were trees and flowers, paths wide enough to permit the passage of a god. He could smell apples, or their equivalent—pears, peaches, grapes . . . Somehow he was reminded—perhaps by the brooding loveliness of the place—of the many women he had been attracted to, some of whom he had married, but none of whom he had loved.

As he stood there, he became gradually aware of a strange outcropping some distance to his right and slightly beyond the periphery of his vision. Turning his head, he saw a pair of gray columns that seemed to have broken halfway up and fallen back upon the hillside. Rising from their juncture with the slope was what appeared to be a granite monolith surmounted by a boulder. Granite pillars somewhat smaller than the columns seemed to lean against the monolith on either side and these, too, seemed to be divided into two sections. Tangled vines covered the top and the sides of the boulder and the lower part of its face. The face was craglike, frightening. A pair of glacial eyes glinted in the depths of two dark caverns.

Even as recognition smote him, Starbrook saw the pillarlike arm come up and the blinding thunderbolts leap forth from the extended fingers of ʃ(.(./'s left hand. There were at least a dozen of them. All of them found their mark—and all of them passed harmlessly into the ground. A terrible silence ensued. Starbrook could not move. Suddenly he felt a terrible tearing sensation in his chest, and pale mists of pain rose about him. Through the mists he saw ʃ(.(./ rise to his full height, a scepter-like object in his right hand. He saw the deity turn and walk disdainfully away. He felt the ground shudder, saw the orange-peel stars shiver in the sky. A spasm of pain sledgehammered him to his knees. He forced himself to stand erect, made his legs move in the direction of camp. End of Round One.

(The introduction of civilization to the natives of Love parallels the introduction of civilization to the natives of the Solomon Islands. First came the traders with their trinkets, then

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came the missionaries with their missals. The neotraders were university bred, but basically no different from their ancestors. The neomissionaries were suave salesmen, but the god they carried in their briefcases differed but little from the god their ancestors had sold to the Melanesians. During their stay on Love they proselytized all of the major races, but only one need concern us here—the 70∠. The 70∠ were bronze-age husbandmen without a spoken language who communicated by means of mentally projected ideograms. Like most primitive races, they were capable of creating superbeings—i.e., of subverting reality through the sheer weight of a collective belief and subconsciously bringing to life the object of that belief—and if left to themselves they probably would have come up with a Grendel or two and have supplied themselves with a suitable cosmogony by inventing—and bringing to life—a pantheon. The missionaries changed all this by instilling in the minds of their converts the concept of one god—their own—thereby eliminating any need either for a pantheon to explain the inexplicable or for an ogre to wreak vengeance. The missionaries were unaware of the 70∠'s gift, because at that time space travel had brought to light only a few superbeings, and the Inquiry into the Past that was to reveal that the gift of creation was not confined to extraterrestrial races but had once existed among the primitive races of Earth had only just begun. Inevitably, after the missionaries' departure, the 70∠ gave subconscious birth to a god much like the missionaries' own. They endowed him with both omnipotence and omniscience and programmed him with Genesis, Exodus, Deuteronomy and all the rest, and located him on a remote mesa. Remembering how their race had been exploited by the traders, they instilled in him—as a sort of subconscious afterthought—a hatred for and an instinct to destroy outsiders. Despite his vindictive nature—or perhaps because of it—∫(.(./ turned out to be a good god. Although he seldom descended from the Mesa—or left his demesne, for that matter—and was rarely seen, he succeeded by the mere fact of his existence in keeping the 70∠ on a straight and narrow path. As a result, when the PPTeam arrived to make Love ready for the latest batch of Terran colonists, they decided not only to relocate the 70∠ upon Light but ∫(.(./ as well. They saved him till the last, only to find that none of them had the remotest idea of how to go about the job. Ordering him to go was out of the question. Forcing him to go involved the risk of life and limb. At length they decided to contact the Department of Galactic Guidance and request that a professional Beowulfer be dispatched to the scene. Enter Starbrook.)

There was an anvil resting on Starbrook's chest. He tried to shove it off, only to find that it was as intangible as it was invisible.

He rolled over onto his stomach

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and crawled out of his tent. Morning sunlight lay softly on the meadow. Birdsong came sweetly from the woodland, and the morning sky was blue. He found that he could stand, but every time he breathed, fire filled his left lung. Unbuttoning his shirt, he discovered that the whole left side of his chest was swollen and discolored. Moreover, the entire area was so sensitive he could not bear to touch it.

He searched for some sign of a wound, found not the slightest pinprick. He was angry, though not surprised, that ʃ(.(./ should have a weapon the PPTeam hadn't found out about. Aerial surveillance threw a great deal of light on a superbeing's habits, but left most of his capabilities in the dark.

Before retiring for the night, Starbrook had injected himself with self-renewing antibiotics, so even had there been a wound, there would have been no danger of infection. However, the pain-arresters which he had taken coincidentally had long since worn off. He took some more, shaking them into his mouth out of the plastic dispenser he had found in the airfarer's medicine cabinet. They took hold quickly, and he was able to eat a good breakfast.

As soon as he finished, he went over to the airfarer, pulled the mule out of the cargo-compartment, tethered it to a tree so it wouldn't float away and began loading it with the equipment and supplies he would need for his morning's work. It was piled high when he got through and he had to increase the pressure in the buoyancy tanks and secure the load with several lengths of rope.

He deactivated the repulsifield to get the mule through, then went back and reactivated it. Before setting forth, he checked the area surrounding the invisible canopy for footprints—large ones. He did not find any, nor had he expected to. One of ʃ(.(./'s characteristics that the PPTeam's aerial surveillance had thrown light on was his disinclination to wander far from his demesne. There was yet another reason Starbrook hadn't expected to find footprints: if ʃ(.(./ had wanted—or been able—to finish him off, he would have done so last night on the hillside. The fact that he hadn't implied either that he couldn't or that he had other plans.

Pulling the mule behind him, Starbrook set off across the meadow. The woodland was filled with birdsong and bright splashes of sunlight. At length he left it behind him and moved out onto the plain. The hills, brownish now in the light of day, marched to meet him. Entering them, he chose a spot some fifty yards south of and on a direct line with the invisible transmissifield, tethered the mule and unloaded it.

The tilt furnace gave him the most trouble. After jockeying it into place, he loaded it with three twenty-pound 81-3-7-9 brass ingots. Then he thrust the muzzle of the flame thrower into

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the fuel aperture and turned the thrower on. Before sliding the furnace cover into place, he checked to see whether the flame was swirling round the crucible. It was.

The roar of the thrower filled the morning, driving the silence from the hills. Before long, ʃ(.(./ would come around to investigate. Starbrook kept an eye out for him as he went on with his work. There was a flat expanse of gravelly ground not far from the furnace that would do nicely for a floor. He carried the flask and the pattern over to it, inserted the pattern between the cope and the drag and set the flask down, drag uppermost. Then he got the two cartons of perma-moist molding sand and dumped one of them into the drag. Getting his shovel, he tamped the sand down with the handle, then smoothed it out. Then he got the bottom board, set it in place and turned the mold over. Glancing sideways, he caught a vast movement beyond the transmissifield. He grinned. ʃ(.(./ was taking the bait. Moreover, he was approaching the trap from exactly the right angle.

After making the cope and cutting the sprue, Starbrook checked the heat. The flame thrown by the thrower was of such high intensity that the ingots were already molten. Returning to the mold, he raised the cope to the accompaniment of the cicadalike crescendo of the inbuilt vibrator. Both the flask and the sand were lightweight; nevertheless, the mold was a large one and the lift required all his strength. Setting the cope to one side, he raised the pattern. Thanks to the special molding sand, both the cope- and the drag-impressions were flawless. Getting the core, he set it carefully in place, then he punched half a dozen tiny holes in the cope so the gases could escape. Finally he lowered the cope onto the drag, searched for and found a flat rock about ninety pounds in weight, and set it on top of the mold.

The metal was not quite ready. While waiting for it to reach the 2,100 degrees Fahrenheit he needed for teeming he paced back and forth between the furnace and the mold. He could see ʃ(.(./ clearly now. The deity was standing just beyond the transmissifield, looking first at the furnace and then at the mold. By light of day he seemed far less formidable, although his proportions were trans-heroic. He was wearing a saronglike garment fashioned from a length of material large enough to sail a boat. His gray beard fell all the way to his middle, and his shaggy hair was shoulder-length. His arms were on the skinny side, and so were his legs, which were slightly bowed. But his eyes left no doubt as to his godhood. They were like a pair of pulsars. He still carried the scepter-like object Starbrook had noticed the night before. Somehow it did not jibe with his appearance or his background. A staff would have suited his Judaeo-Christian character better.

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In one way, it was ridiculous to be going to so much trouble to transmit him to Light. Superbeings existed only for that length of time their creators believed in them strongly enough to keep reality from realigning itself. Generally the length of time they were able to sustain such beliefs was limited to two or three generations; hence, any superbeing's days—⌈(.(./'s included—were numbered, and whether he were transmitted to Light or remained where he was, ⌈(.(./ was due to pop out of existence in the foreseeable future.

Starbrook checked the heat again. The yellow-whiteness of the metal told him that it was ready, and he turned the flame thrower off. Getting the long-handled ladle, he put the furnace on tilt and lined up the ladle with the lip. He caught the molten flow deftly, his repulsifier protecting him from the heat, and when the furnace was empty and the ladle full he set the latter down and skimmed it. Then he carried it over to the floor and poured the mold.

Laying the ladle aside, he removed the stone weight. He was sweating, and the pain in his chest was coming back. ⌈(.(./ had moved farther into the pass and was standing little more than an arm's length from the transmissifield. The success of his stratagem thus far made Starbrook temporarily forget his pain.

While waiting for the casting to cool, he looked for a suitable pedestal. There was a flat-topped boulder several yards from the floor that would do nicely. An altar wouldn't be necessary: the analogy didn't have to be letter-perfect. To kill time, he walked back and forth between the pedestal and the mold, noticing for the first time that the range of hills was really two ranges separated by a wide arroyo. It was in the middle of this arroyo that he had set up his one-man foundry.

He waited about forty-five minutes longer, then approached the mold and raised the cope. Using the sprue for a handle, he pulled the casting free from the drag and shook it. It looked good. He got the automatic saw and the portable sander and, working with his back to ⌈(.(./, cut off the gate and the sprue, and the gas-hole risers, after which he sanded the areas flush with the casting proper. Then he went to work on the metal with a wire brush. It began to gleam—though not as brightly as gold would have; but of course gold had been out of the question, and besides, ⌈(.(./ wouldn't know the difference.

Starbrook grinned. Picking up the "golden" calf, he carried it over to the flat-topped boulder he had chosen for his pedestal and set it in place. It was slightly smaller than life-size, but realistic in all other respects. Starbrook grinned again, then backed up several paces and genuflected. Straightening, he stepped to one side, providing ⌈(.(./ with an unobstructed view of the object of his reverence.

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⌈(.(./'s craglike face grew gray. Crevices opened up between his flared nostrils and the corners of his traplike mouth. His eyes, black to begin with, acquired an even deeper darkness. In the absence of a Moses to do his will, he should have come rushing through the transmissifield with the intention of dashing the calf from the pedestal and pulverizing it beneath his feet—and have wound up millions of miles away on Light.

He should have, and perhaps he would have, if, in his monumental rage, he hadn't forgotten Starbrook's immunity to thunderbolts and launched a dozen of them in the hated outsider's direction. When they vanished less than a cubit from his fingertips, he blinked.

For a long while he stared at the point in space where the bolts had disappeared. At length, he smiled. A cunning smile. He raised his arms.

It began to rain.

The rain sent steam rising from the furnace. It hissed when it struck the still-warm "golden" calf. Starbrook's repulsifier broke it up into infinitesimal particles, but failed to keep it out.

It fell gently at first. Then it picked up tempo and was accompanied by lightning and thunder. All at once, it turned into a cloudburst.

The arroyo filled with frightening rapidity, and a young and vigorous river took form between the hills. Starbrook tried desperately to reach the mule, only to see it break free when he was halfway to it and drift off in the direction of the current. Next, he tried to reach higher ground, but by this time the water had risen to his waist, and he hadn't gone three yards before he lost his footing.

Helpless, he went tumbling downstream. His repulsifier shielded him from the rocks, but it could do nothing about the water that forced its way into his lungs. He grabbed frantically at the boulders he collided with, at the outcroppings the current threw him against. At last his fingers found and gripped the roots of a small tree and he pulled himself laboriously from the torrent and crawled halfway up a friendly hill. As though by prearrangement, the rain stopped and the sun came out. Dejectedly Starbrook looked back the way he had come. The pain in his chest was so intense he could hardly breathe and the water he had swallowed made him retch. Once again he forced himself to his feet and made his legs carry him in the direction of camp. End of Round Two.

(It should be emphasized that both "omnipotence" and "omniscience" are relative terms. Thus, while the 7 0 ∠ had endowed ⌈(.(./ with both qualities, he was all-powerful and all-knowing only to the limited extent they could conceive of him as being. And it should be emphasized also that although the 7 0 ∠ attributed to him the ability to create life, his actual ability was severely curtailed. Reality,

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already strained to the breaking point by the mere fact of his existence, permitted him to exercise his power only if the basic materials were available and allowed him to perpetuate life only so long as he could, by force of will alone, hold reality at bay. Once his will faltered or once his presence was removed, reality asserted itself, and whatever changes he had made in the natural order of things were quickly corrected.

It was well past midday by the time Starbrook got back to camp. A handful of pain-arresters had put his pain to rout, but he was as tired as he was bedraggled, and after slipping through the repulsifield, he headed directly for his tent.

The loss of rounds one and two to ʃ(.(./ nettled but did not dismay him. The transmissifield projector was impervious to water and on high enough ground not to have been washed away by the river. Therefore, he still possessed the means of evicting ʃ(.(./. However, since there was little likelihood that the diety would voluntarily step into the field, the projector would have to be relocated.

Getting ʃ(.(./ out of the way long enough to accomplish the task posed no problem, but finding a new site did. The plan Starbrook finally settled upon could not be effected till after dark, so he lay back on his inflatable bed and relaxed. Despite his pain, which was coming back again, and despite his tiredness, he felt keenly, intensely alive. He was reminded of a remark Harry Westwood had made about Beowulfing when the two of them were on a hunt together. "Hunting down a superbeing is like driving in that ancient superchariot race they used to call the 'Indianapolis 500'. The only time those drivers were really alive was when they were on the track. That's the way it is with us. The only time *we're* really alive is when we're on the trail of an ogre, a dragon, or a god."

At the time, he and Harry had been standing about a hundred yards from the mouth of the rocky cave where their quarry lived. The quarry was a genuine fire-breathing dragon named Sssth which the Zendi of the planet Lost had invented to scare their children and subconsciously brought to life when they began believing in it themselves. The fact that Galactic Guidance had assigned two Beowulfers to exterminate it was an index of its size and ferocity.

"I'll tell you what," Harry said presently. "I'll go in and step on its tail and flush it out."

Starbrook hadn't demurred. He had known it wouldn't do any good. He disliked the idea of working with Harry Westwood. Westwood was too reckless. He had a prosthetic hand to prove it. Harry never talked about it, and GG's publicity division, in contrast to its usual custom of bruiting the exploits of Beowulfers to the four thousand corners of the galaxy, had kept the story secret; but Starbrook

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had it from a reliable source that the reason Westwood had a prosthetic hand was that an ogress had bitten off his real one.

Anyway, Harry had gone into the cave to flush Sssth out, and Starbrook had waited about a hundred yards from the mouth, Dammerung at ready. But the two Beowulfers had been badly briefed, and less than a minute later Harry came stumbling out of the cave, blinded by a poisonous spray neither had known to be part of Sssth's arsenal. Some thirty yards from the mouth, he tripped and fell, adding a sprained ankle to his troubles. By then, Starbrook was running to the hunter's aid. By the time he reached him, Sssth had emerged from its cave like a young locomotive under full steam. Straddling Westwood's body, Starbrook calmly shot out the beast's four eyes, then sent a charge straight into its brain. The ghastly thing fell dead hardly a foot from the toe of his boot.

Westwood's vision had returned in time for him to witness the finale. "Damn you, Barney," he said, "why'd you do such a crazy thing!"

"I didn't think you'd look right with a prosthetic head."

"But you could have got the thing from where you were standing. You could have played it *safe!*"

"I guess I was trying to prove that my third wife didn't have any more justification for walking out on me than my first and second ones did," Starbrook said.

"Only to prove," Westwood said, "that she had all the justification in the world, because if you'd still been married to her you'd have done the same thing—without a thought of what your death might do to her."

Starbrook didn't say anything. He helped Westwood to his feet. The two men looked at the loathsome mountain of carrion before them. Soon, the Zendi would divide it into choice and not-quite-so-choice cuts and a celebration would be held and the two hunters feted. Starbrook shuddered.

"Knock it off, Barney," Westwood said. "You've killed enough of them by now to be used to it."

"It's not the killing that bothers me. It's what makes people like me tick."

"Well it *shouldn't* bother you," Westwood had said. "Because what makes you tick is the same thing that made Lindbergh tick when he flew that prop-propelled orange crate of his across the Atlantic, that made Harding and Caldwell tick when they refused to be rescued from the Wall of Morning Light, that made Hannibal cross the Alps, that made Kennedy into a sitting duck in Dallas. If it didn't bother those guys, why should it bother you?"

At dusk Starbrook ate a leisurely meal. After he finished, he spread out the map of the Mesa that the PPTeam had provided him and studied it by lanternlight. It was based on the same multi-magnified orbital

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photo whose image he carried in his mind, but it contained a mileage scale, and the image didn't.

After computing the distance to his target area, he rotated the air farer's small turret cannon till its muzzle pointed in the proper direction, then fed his computations into its brainbox. He waited till the weapon adjusted itself, and when its ready light went on he sent three incendiary shells climbing into the sky. Reaching the apex of their trajectory, they coasted down into the thick forest that flanked ⎡(.(./'s demesne on the north, and detonated. The northern sky turned red.

Starbrook was going to have to move fast. ⎡(.(./ was bound to investigate a forest fire of such suddenness and intensity, but a deity of his rain-making capability would have no trouble containing it. Donning his V/ii5 goggles and activating his repulsifier, Starbrook set forth. The northern sky had brightened to a vivid orange by the time he reached the plain, but even as he congratulated himself he saw the first bolts of lightning and heard the thunder, and knew that ⎡(.(./ was already taking countermeasures.

Presently he entered the hills. Only a scattering of puddles remained of the river that had raged through the arroyo that morning. Nothing whatsoever remained of his founding operation—not even the "golden" calf. Alert for the slightest sign of ⎡(.(./ he climbed the eastern slope of the pass to the shelf where the transmissifield projector sat. Carefully he felt for the switch, and turned the field off.

Carrying the projector, he descended the slope, walked through the pass and entered the garden. It was his intention to reset his trap in one of the garden paths. He came to one presently, and began following it. It was wide, and appeared to be well-traveled. Yes, it ought to do.

He was dumbstruck when a girl emerged from the shadows of the trees and stepped into the starlight.

Thunder sounded from the north, but above the garden the skies remained clear.

The girl barred Starbrook's way. She wore nothing but her nakedness. It was all she needed to wear. A dark swirl of hair swept the left side of her face. Her black eyes seemed to glisten.

He removed his V/ii5 goggles, found her lovelier yet. She projected her name into his mind: (*∠*). He tried to project his into hers, but of course he couldn't, for it had no 70∠ equivalent.

But she couldn't be a 70∠. She was as Caucasian as he was. Besides, all of the 70∠ had been relocated on Light.

Somehow, it did not seem to matter what she was, or what she was doing on the Mesa. She reached out to touch his face, recoiled when her fingers came into contact with the repulsifier. He turned it off. She reached forth again, and this time

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her fingers brushed his cheek. She drew him eagerly into the shadows of the trees, down into the scented softness of flowers. It was as though he were the first man she had ever seen.

He could smell apples, and the apples were her breath. The pounding of his heart became a huge drumbeat in his ears. It grew larger, louder, spread throughout his body and penetrated the very earth. Shudders like rhythmic seismic waves shook the ground. It was as though a giant were walking—

A giant—or a god.

The truth detonated in Starbrook's brain, brought him to his feet. His frantic fingers found the control knob of the repulsifier on his belt, and in a second he was safe.

The forest fire had saved his life. If ⎛(.(./ had not gone to investigate, he would have been in the garden, waiting. Now, aware that the fire had been a ruse, he was hurrying back to check his trap, hoping that Starbrook had taken the bait and was still vulnerable.

Retrieving the projector from where it had fallen among the flowers, Starbrook seized (*∠*)'s hand and began running with her toward the hills. All was not yet lost. With a little luck, he not only could escape ⎛(.(./, but evict him as well.

Half dragging the girl and ignoring the recrudescence of his pain, he entered the hills. From behind came the crackling of tree branches as ⎛(.(./, desperate to reach his enemy before it was too late, plunged into the garden. Starbrook moved deeper into the hills, looking for a high ledge that was unassailable from the front but easily accessible from the side. He was hampered by the loss of his V/ii5 goggles, which he had dropped in the garden.

The hills were full of ledges, and eventually he found what he wanted. By this time, ⎛(.(./, too, had entered the hills, apparently having concluded that Starbrook and the girl were no longer in the garden. The ground trembled at his approach, and the rattling of small avalanches filled the night. Flanking the ledge on the left was a gentle slope that began at right angles to it, then U-turned halfway up. Pulling the girl as far as the turn, Starbrook left her there and returned to the base. There, he set up the projector and projected the transmissifield at right angles to the cliff.

Rejoining (*∠*), who had been watching the proceedings with mystified eyes, he took her hand and led her up to the ledge. There, he waited till ⎛(.(./ came striding over the hills, then took the woman the deity had made of his rib into his arms.

She recoiled from the tingling of the repulsifier, which now engulfed her as well as him, and he had to hold her tightly so that ⎛(.(./ would assume that, unable to resist her, Starbrook had turned the "thunderbolt shield" off. The deity could not know, of course—and indeed, Starbrook himself had forgotten only a

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short while ago—that the juxtaposition of a second body caused the field to double itself.

∫(.(./ had halted about a hundred feet from the cliff. Significantly, the "scepter" was missing from his right hand. The expression on his face was a curious mixture of self-satisfaction and righteous indignation. His analogy hadn't been letter-perfect either, but it had served its purpose. Now, the re-enactment of the original sin was taking place right before his eyes. Small wonder that he should assume that the "thunderbolt shield" was no longer functioning.

His self-satisfaction was short-lived. It died with the first series of thunderbolts he sent Starbrook's way. After the second, it turned over in its grave. Meanwhile, his righteous indignation grew into righteous wrath—a wrath so overwhelming that he forgot he was a god and strode purposefully toward the cliff, his eyes burning like black bonfires. But his fingers fell far short of the ledge where the Man and the Woman were, and though he tried mightily, he could not claw his way up the rock face of the cliff.

Suddenly he saw the slope, followed it up with his black bonfires of eyes to where it U-turned. A giant step brought him to its beginning. A second giant step carried him all the way to Light.

Starbrook looked down to where the transmissifield invisibly pulsed in the night. The slope was empty.

His heroic rescue of Harry Westwood had made him famous. His successful eviction of the 7 0 ∠ god would make him legend.

He became aware of the girl beneath him, of the warmth of her naked body, of the adoration in her eyes. Of necessity, his love-making had been simulated. Now, the passion he had known in the garden returned, tempered by a quality he had never experienced before and therefore did not recognize.

As he looked tenderly down upon her childlike face, he realized that the grayness of the ground was showing through her features. Simultaneously, as the rib that ∫(.(./ had psychosurgically removed began to rematerialize, he experienced a lessening of the pain in his chest.

"No," he whispered. "No!"

(* ∠ *) was diaphanous now. He watched helplessly as she faded away. Only after she had vanished utterly did the knowledge smite him that he had found—and lost—the only woman in the world whom he could ever love—who, in a way, he had been in love with all his life.

He got numbly to his feet.

Bone of my bones. Flesh of my flesh . . .

He struck across the hills and over the plain and walked through the woodland. The airfarer awaited him. Like Charon, it would ferry him across the Styx. He always came in first in the Indianapolis 500, but he never won. ■

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The intriguing questions of cosmology are: How did it all start? How will it all end?

Cosmologists have spent centuries studying, theorizing, and arguing about origins—the origin of the Earth, the solar system, the stars and galaxies, the universe. In the past few years, though, the discoveries of the quasars and pulsars, neutron stars and exploding galaxies, have forced them to look into the question of endings.

In particular, the phenomenon of gravitational collapse has come under careful study. It turns out to be a weird and wonderful domain wherein might lie the secret energy source of the quasars, the power behind galactic explosions, a domain where massive stars can wink out and completely leave this universe, and—just maybe—a domain in which we might find the answer to faster-than-light travel.

Like so much of the past decade's new astronomical thinking, it was the quasars that prompted an intense look at the mechanics of gravitational collapse. The energy output of the quasars is so huge that old ideas about energy production in stars and galaxies had to make way for new concepts. As Table I shows, a typical quasar is emitting more visible light energy than a thousand Milky Way galaxies! And as much radio energy as the strongest radio sources known.

Just to put those very large numbers in some sort of context: M 87 is one of the largest and brightest (optically) galaxies. It probably contains a trillion (10^{12}) stars. Yet the quasars are typically a hundred times

TABLE I:
OPTICAL AND RADIO OUTPUT OF GALAXIES AND QUASARS

Sources	Optical Output (KW)	Radio Output (KW)
Milky Way (spiral galaxy)	10^{33}	10^{28}
M 87 (elliptical galaxy)	10^{34}	10^{32}
Cygnus A (strong radio source)	10^{33}	10^{35}
Typical Quasar	10^{36}	10^{35}

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brighter. Cygnus A is one of the strongest radio sources in the sky, and the quasars are just as powerful in radio output. The energy output for quasars shown in Table I is roughly equal to the energy emitted in *ten billion* supernova explosions, or the energy obtained by the *total annihilation* of ten million stars.

Could there be ten billion supernovas blazing in chain reaction in a quasar? Or 10^7 solar masses of matter and antimatter merrily destroying each other in a million-year-long celestial fireworks?

And although the quasars seem to be emitting as much, or more energy, as the most powerful optical and radio sources in the heavens, they are apparently much smaller than any galaxy. How can the energy of a thousand galaxies be packed into a space that's considerably smaller than a single galaxy?

So far, we've tacitly assumed that the quasars are "cosmologically" distant—a billion light-years or more away from us. This put them out at the edges of the observable universe, for the most part. This is exactly what astronomers did in the early 1960s, when they first realized that the quasars are very different from anything they had previously seen.

The reason that the quasars were

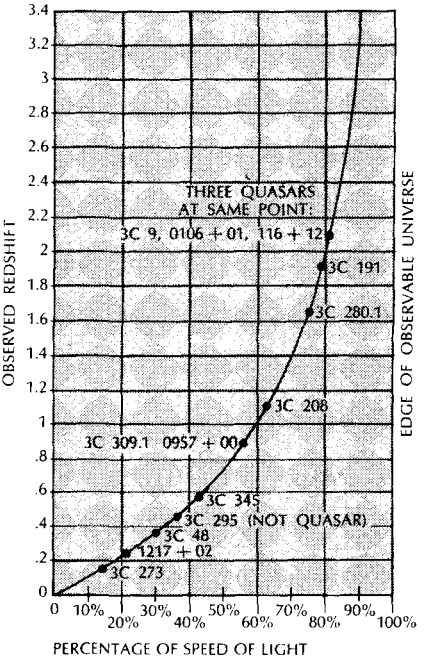

Fig. 1. The observed red shifts of several quasars and the galaxy 3C 295, believed to be the farthest-known true galaxy. The curve shows how the red shift is related to the object's recession speed, based on the assumption that the red shifts are due to the expansion of the universe. Curiously, no quasar has been observed to show a red shift much beyond the 80% of lightspeed mark.

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assumed to be "cosmologically" distant is that they show tremendous red shifts. The farthest known true galaxy, 3C 296, has a red shift that's estimated to represent a speed of recession of 36% of the speed of light. This works out to a very rough distance estimate of five billion light-years. Most quasars do much better. A handful of quasars have such huge red shifts that they're apparently moving at 80% of lightspeed: this yields a distance judgment of 10 billion light-years. Curiously, 80% of *c* seems to be the limit of the quasars' recession speed; none have been observed going any faster.

This red shift method for gauging cosmic distances is, at best, very rough, and depends on an interlinking chain of assumptions: (1) that the observed red shifts are Doppler shifts, caused by the objects' rushing away from us; (2) that the reason they're moving away is that the whole universe is expanding, and expanding *uniformly*, so that the farther away a galaxy or quasar is from us the faster it's receding; therefore

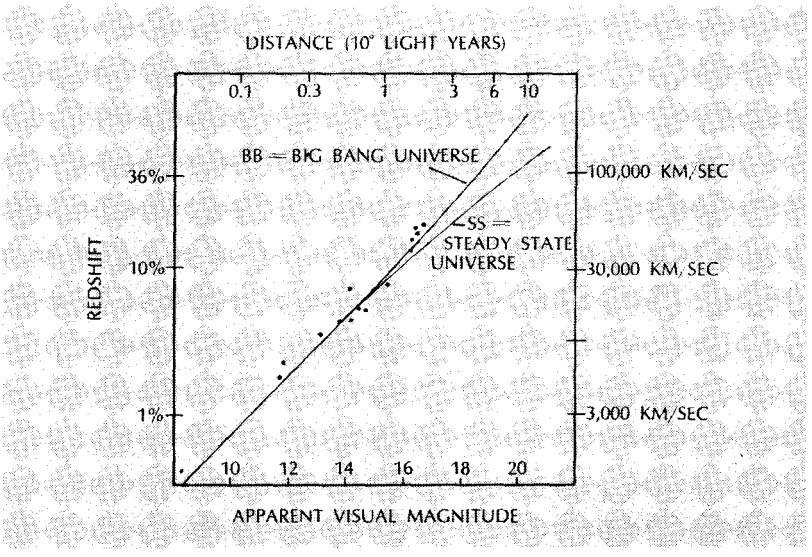

Fig. 2. The Hubble relationship of red shift to distance for a group of distant galaxies. No quasars are shown on this graph. The trend of the data for galaxies favors the Big Bang cosmology; that is, the farthest galaxies tend to be brighter and more numerous than would be predicted by the Steady State cosmology. If the quasars are truly at cosmological distances (5 to 10 billion lightyears) they would lend still more weight to the Big Bang theory.

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(3) the larger the red shift, the faster the object is receding, and thus the greater its distance from us.

This whole red shift business started with the American astronomer Edwin P. Hubble, who announced in 1929 that all the farther galaxies—outside our own Local Group of 17 gravity-linked galaxies—show red shifts. Moreover, Hubble showed that if you make a graph plotting the brightnesses of galaxies against their red shifts, the relationship is a beautiful straight line. This is extremely powerful evidence that the red shifts are truly related to distance.

But, if you plot the brightnesses of the known quasars against their red shifts, you don't get a straight line at all. You get a wild shotgun pattern, with no apparent relationship to anything except confusion.

This led Fred Hoyle, the British cosmologist, to begin wondering if the quasars' red shifts might be completely unrelated to distance. Maybe the quasars are not cosmologically distant at all, but relatively nearby, perhaps only a few million light-years away, at most.

Recognize that Hoyle needed "local" quasars if he was to save his well-known Steady State theory of cosmology. For the quasars—if cosmologically distant—tended to show that the universe was definitely very different 10 billion years ago than it is today. If you count the quasars and galaxies together, the universe was more densely packed with such objects 10 billion years ago than it is now. All this destroys the Steady State theory, which claims that the universe has always been about the same as it is now.

The opposing Big Bang cosmology pictures the origin of the universe in one cataclysmic burst of energy. Many cosmologists looked on the quasars as evidence for that primal explosion. But, if Hoyle could show that the quasars are local objects, and not related to events of 10 billion years ago, then the Steady State theory might still survive. On the other hand, if it could be shown that the quasars are local and their red shifts not related to distance, then some doubt gets cast on the value of red shift measurements for judging the distances of all the galaxies. Some doubt might even be cast on the very concept of an expanding universe. So the local *vs.* cosmological quasar argument had—and still has—high stakes attached to it.

Thus it was in 1963 that Hoyle and William Fowler, astrophysicist from CalTech, proposed that the quasars might be supermassive objects relatively close to our own galaxy. They saw the quasars as being much smaller than a galaxy, perhaps like a globular star cluster, but with a mass of 100 million times the sun's. For lack of a better tag, call it a superstar.

Both the energy output and the red shift of the Hoyle-Fowler superstar was attributed to gravity. Grav-

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itational collapse provided the basic energy for the superstar's outpouring of light and radio waves, as gravitational energy is converted to electromagnetic while the superstar shrinks in size and becomes constantly denser, more compact. And the powerful gravitational field of this supermassive object causes the red shift. As photons work "uphill" against such a strong gravitational field, they are shifted down toward the red end of the spectrum. Similar effects, although much smaller in magnitude, have been observed on the sun and other stars.

The superstar idea came under immediate attack—as have all theories hoping to explain the quasars. A single object of 10^8 solar masses could not remain stable, said the physicists. All right, said the theory's backers, call it a super-star-cluster, then. It can still be treated as a single object even if it consists of many smaller parts. And, they showed, if the superstar were rotating rapidly enough, it would not break up.

The argument is still going on. Big Bang cosmologists want the quasars to be cosmologically distant. Steady State people want them local. In all fairness, there have been several other suggestions that the quasars are local. For example, James Terrell of the University of California proposed in 1964 that the quasars might be something like massive star clusters that have been shot out of our own or nearby galaxies. The red shifts, then, would be Doppler shifts caused by the ejected quasars' recession, but would have no relation to cosmology.

That same year, C. R. Lynds of Lick Observatory and Alan Sandage of CalTech showed definitely that the galaxy M 82 was in the throes of an explosion. Its core had blasted itself apart, perhaps as recently as a few hundred thousand years earlier. Could the quasars be "shrapnel" fired out of exploding galaxies?

More on galactic explosions shortly.

The idea of gravitational collapse powering the quasars was not restricted to local-quasar enthusiasts. Even the astronomers and cosmologists who backed the cosmologically-distant quasar theory considered gravitational energy as a possible source of the quasars' enormous brightness. In this case, they looked on the quasar as something about the size of a galaxy that's collapsing inward on itself. The energy release could be purely gravitational in origin, or it could come from the collision and explosion of billions of stars in the galaxy's core, as they were squeezed together in the general collapse of the galaxy.

The discovery of the quasars and the earlier realization that the so-called radio galaxies frequently have small regions in their cores from which most of the radio energy emanates, led astronomers to begin paying more attention to what's going on in the cores of galaxies.

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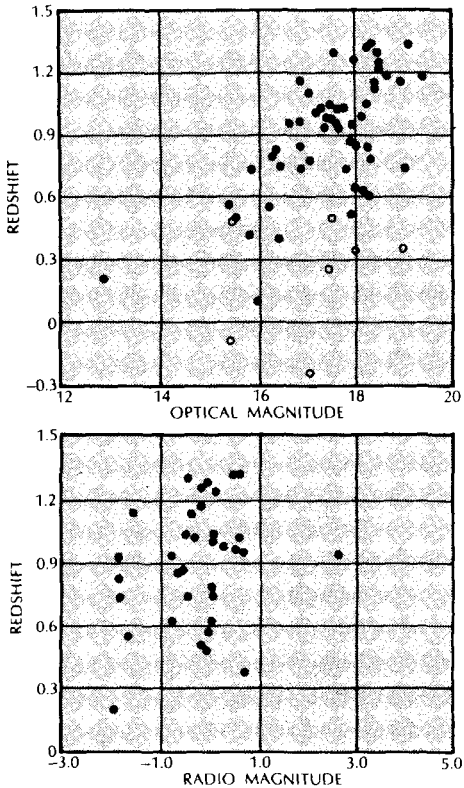

Fig. 3. Plots of quasar red shifts vs. optical magnitudes (top) and radio magnitudes (below) show no discernible pattern. The straight-line Hubble relationship of normal galaxies does not apply for quasars, lending some doubt to the conclusion that the quasars are cosmologically distant.

They dusted off the work done in the 1940s by the American astronomer C. K. Seyfert, who studied a number of galaxies that have extraordinarily bright cores. Seyfert galaxies, as they're now called, have very active cores in which there's much loose gas that's highly excited and moving with velocities of some 4,500 km/sec. While Seyfert worked exclusively with optical telescopes—radio astronomy was still only a gleam in Grote Reber's eye—more recent radio studies of the Seyfert galaxies show them to be fairly powerful radio sources, with the radio emission coming from those bright, agitated cores. Incidentally, the Seyfert galaxies resemble the quasars in many respects, including the fact that they both tend to show sizable variations in light and radio output. But the quasars are at least a thousand times more powerful—if they're cosmologically distant.

By the mid-1960s evidence for galactic explosions began pouring in. Lynds and Sandage showed that M 82 is exploding. Short-exposure photographs of M 87 showed that it has an optically bright spot at its core, with a jet of glowing plasma, some 30,000 light-years long, streaking off to one side! Previous photos of M 87, long-time exposures to catch the faintest star clusters around it, had washed out this feature completely.

There's even a strong chance that our own galaxy suffered a core explosion at least a million years ago. There's a "halo" of radio-emitting gases around the Milky Way that could have been ejected from the core in an explosion similar to M 82's. Some astronomers now be-

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lieve that most, if not all, of the radio activity in galaxies and quasars is associated with explosions at the core.

What causes galactic explosions? Where does the energy come from? Is it a coincidence that the energy involved in an exploding galaxy, according to most calculations, works out to be very similar to the energy output from the quasars?

As in the case of the quasars, theoretical explanations for galactic explosions abound. Again, they include outright gravitational collapse, stellar collisions and/or supernova chain reactions, and matter-antimatter annihilation. Each possibility needs some sort of gravitational collapse to make it work. And again, none of the explanations can answer all the tests and objections that have been brought out.

As you might suspect, all this attention on gravitational collapse as a power source for quasars and exploding galaxies led the astronomers and cosmologists to turn expectantly to the physicists for some answers. And that's just what they got—some answers. Not *the* answers they were looking for, alas, but some fascinating food for further thought.

The physicists had been following the same gravitational-collapse trail from a different starting point. They were studying individual stars in an attempt to explain the evolution of a star—an evolution that sometimes ends in a supernova explosion. It's ironic that the physicists were sniffing along this trail because of their interest in what was, up to the mid-1960s, the most titanic catastrophe known to man: a supernova. And when they bumped noses with the astronomers, it was because the astronomers had found cataclyms ten billion times mightier.

Let's get away from quasars and galaxies for a while, and start thinking about plain little old stars—like the sun. In following the physicists over this portion of the trail, we'll soon enough re-emerge into the wider cosmos of pulsars, neutron stars, quasars, expanding and contracting universes, and—as advertised earlier—maybe faster-than-light travel.

Stars begin life with gravitational collapse. The sun, for example, was a loose cloud of gas and dust some five billion years ago. Under its own gravitational forces, the cloud contracted in an astronomical eyeblink—about 50 million years, according to computer calculations—and formed a medium-sized star and some cosmic debris orbiting around it.

Why did that gravitational collapse stop where it did, leaving the sun with its present almost-perfectly-spherical diameter of 1.39 million kilometers? Because at the sun's central temperature of some 20 million degrees Kelvin, hydrogen fusion reactions produce enough gas and radiation pressure to balance the still-present gravitational pull of 2 x 10^{27} tons of matter.

In another five to ten billion years,

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Fig. 4. An exploding galaxy, M 82. The light areas are the main body of the galaxy, photographed in normal light. The dark region shows vast jets of gas, photographed in the light of ionized hydrogen and printed in negative for contrast. The explosion filaments are roughly 14,000 lightyears long and moving with velocities of about 1000 km/sec.

the sun's hydrogen supply will start to run low. Most of its core will be helium, created from the hydrogen fusion process. The core will thus be denser than it is now, and hotter. Its central temperature will rise to some 100 million degrees, and then the helium will begin to fuse into carbon, oxygen and neon.

At the higher core temperatures associated with this new energy source, gravity must yield somewhat to increased gas and radiation pressure. The sun's outer layers will expand. The surface of the sun—photosphere—will become distended and cooler. The sun will become a red giant star.

The same routine gets repeated over and again. As the fusion reactions in the sun's core produce constantly-heavier elements, the core temperature rises. The higher the core temperature, the easier to start fusion reactions with the heavier elements, leading to the creation of

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still-heavier elements, still-higher temperatures, and so on.

Each cycle of new-element-building goes faster than the previous one. Each cycle is bringing the sun closer to disaster. Through it all, gravity is constantly being outfought by rising gas and radiation pressures, and the sun's outer envelope becomes hugely distended. And despite the higher core temperatures, the surface temperature still goes down.

Until the fusion reactions at the core produce iron. When iron nuclei fuse they produce lighter elements, not heavier ones. The game is over. And gravity, which has been patiently waiting all this time, becomes the victor. The remainder of the star's life will depend more on the always-abiding force of gravity than on any other factor.

What happens then?

Since 1915, when the first white dwarf star was discovered—the Pup of Sirius—astronomers and astrophysicists have assumed that somehow most stars must eventually end up as dying white dwarfs. But how does a star go from being a red giant to a white dwarf? (It sounds like a question out of a fairy tale, rather than a problem in nuclear astrophysics.)

And stars have been known to explode. Sometimes rather mildly, in cosmic burps called novas; sometimes dramatically, in supernova explosions that release as much energy in twenty-four hours as the sun emits over a billion years. Where do these stellar explosions fit in? Will the sun explode?

These are the questions that the astrophysicists were working on when the quasar storm struck. One of the leading workers in this field, who has concentrated his studies on the phenomenon of gravitational collapse, is Kip S. Thorne, an associate professor of theoretical physics at CalTech who's barely out of his twenties. Much of what follows is based on his work . . . and the printouts of his computer.

When a star loses the last of its nuclear fuel, or at least loses so much that gas and radiation pressure can no longer keep the star expanded, the ever-present gravitational force in the star becomes the dominant factor in its fate.

For stars of the sun's mass, the story appears to be straightforward. Computer analyses tell us that once gas and radiation pressures can no longer support the star's size, gravity begins to compress the star. It falls inward on itself. The interior density and temperature rise as the gravitational collapse progresses, and eventually this produces a braking action.

The sun's eventual collapse may take place over the span of a few million years. Gradually it will sink from its grossly distended red-giant diameter to a diameter more like our own Earth's—about 12,700 kilometers—and its central temperature will reach nearly a billion degrees. The

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Fig. 5. The elliptical galaxy M 87, one of the largest and brightest galaxies in the heavens, shown here in a long-exposure photograph to capture the faint star clusters orbiting around the galaxy's main body.

density at the core will go up to about a thousand tons per cubic inch. The sun will be a white dwarf star.

Why does the gravitational collapse stop at this point? The star is composed of a plasma, which consists of ions—atomic nuclei that have been stripped of their orbital electrons—and the freed electrons. As the density of the plasma increases, these particles collide more and more frequently. The electrons, which can be thought of as a hazy cloud rather than a firm particle, can undergo some compression. And they do, getting squeezed further and further as the gravitational collapse forces the star's density higher and higher. At a density of about a thousand tons per cubic inch, though, the electrons resist further compression.

This produces the braking action—

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the counterforce that finally balances out against gravity and stops any further collapse of the star.

So now we have a star that's about the size of the Earth, although it still contains just about 2 x 10^{27} tons of matter.

During this contraction phase there may have been some unburned fusible material in the sun's outer layers. But as the interior temperature soared, any fusible elements—from hydrogen to iron—would eventually be heated to their ignition temperature and go off like a bomb. Thorne believes that this may explain the pulsars. More on that later.

The final fate of the sun after having reached white dwarfdom seems rather prosaic. It simply cools off, as the heat generated from the collapse is slowly dissipated into space. The process may take billions of years, but eventually the sun will be nothing more than a cold, dark body, the size of the Earth, with a density of some thousand tons per cubic inch.

But if it's drama you want, consider the fate of the more massive stars.

The computer calculations show that stars with more than 1.4 times the sun's mass don't stop their gravitational collapse when they reach the white dwarf stage. For stars this massive, the electrons' resistance to compression doesn't give enough of a braking force to counteract the gravitational force. The collapse goes on. There are a number of different possibilities as to what happens next. Much depends on the details of the individual star's mass, spin rate, and chemical composition. But the general outlines of the story appear to be firm.

If there is enough unburned fusible material in the star's outer shell, the rapidly rising heat of the core may trigger a supernova explosion. As we've already seen, in a supernova the star may release as much as a billion years worth of solar output inside of twenty-four hours. And, although it seems hard to picture anything as surviving such a blast, it now seems certain that the core of the star remains relatively intact, at least for this type of supernova.

Whether or not there's a supernova explosion, the core of the star keeps on shrinking, past the density of a white dwarf. As the star's diameter keeps getting smaller and its density higher, gravity gets stronger and stronger. If the original star was massive enough, the gravitational force eventually becomes so powerful that the electrons can no longer resist further compression. They are squeezed into the atomic nuclei, turning all the protons in the nuclei into neutrons.

We now have a mass roughly equal to the sun's consisting entirely of neutrons, some 10^{57} of 'em, packed side-by-side in a sphere no more than 100 kilometers wide. Probably more like 10 kilometers across. Density is around a billion tons per cubic inch.

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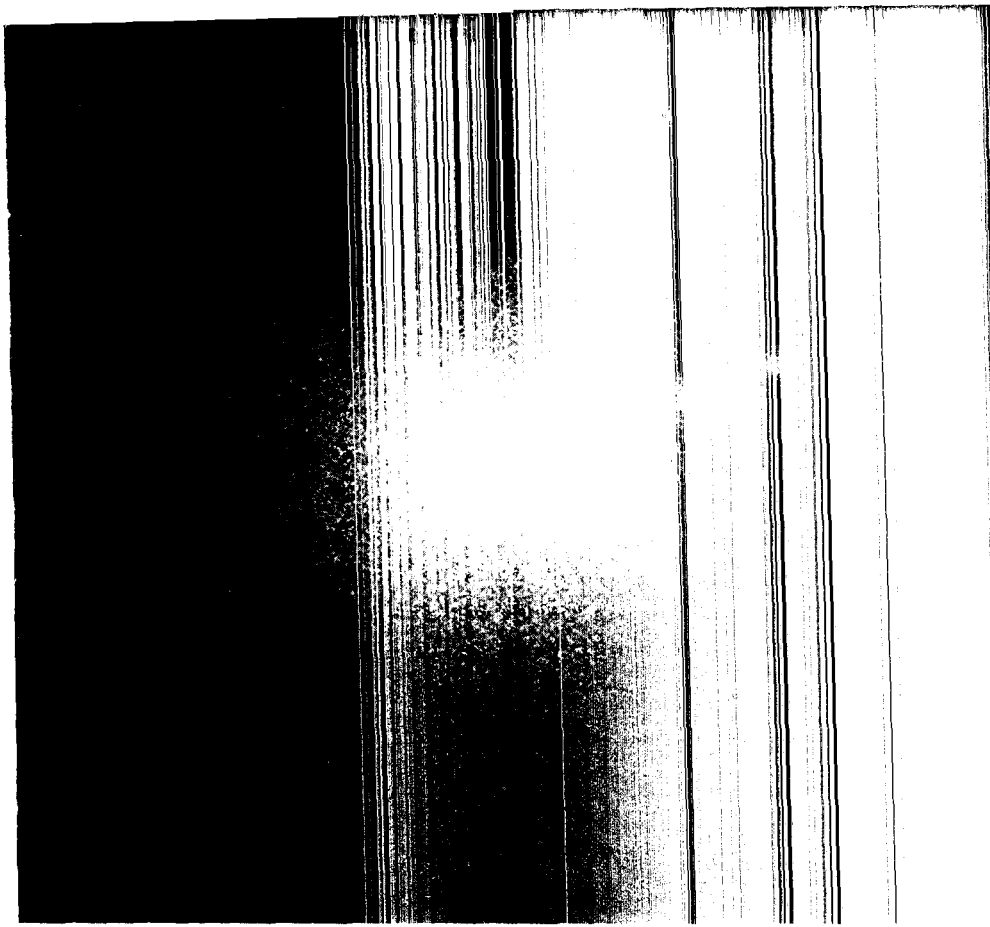

(Mt. Wilson and Palomar Observatories)

Fig. 6. The heart of M 87, in a short-exposure photograph that shows the very bright core and the 30,000-light-year-long plasma jet. Both the core and the jet are strong radio sources.

That's a neutron star.

If the star is not more than two solar masses, the tremendous repulsive forces that the neutrons exert on each other will resist any further gravitational crushing. The brakes are on—neutron brakes this time—and the collapse stops.

But [illegible]

Far from [illegible]

The star's [illegible] neutron-star dimensions. But there are still outer layers of the star, even if much of this material has been blown off in one or more explosions.

This outer shell falls in on the tiny neutron core, since gravity is always hard at work. The impact creates enough heat to drive the core's surface temperature up to billions of degrees for a fraction of a second. Under these circumstances most of

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the heat energy is converted into neutrinos. Not to be confused with neutrons, neutrinos are aloof little particles, much like photons except that under ordinary circumstances a neutrino can penetrate 50 light-years of lead without being stopped.

But the conditions around a neutron star are far from ordinary. The densities and temperatures of the plasma around the neutron core are so high that even the evasive neutrinos can travel only a few meters before they are deflected, or absorbed. Most of their enormous energy is imparted to the plasma clouds, heating them to tens of billions of degrees. You get a supernova explosion, of course. But this is a different type of supernova—a *core supernova* that blows away everything except the tiny neutron star core.

All this—the collapse into the neutron core, the infall of the shell of plasma, the heating that forms neutrinos, the core supernova explosion—all this happens in a few seconds.

The results? Look at the Crab Nebula, that cloud of plasma a few light-years across, still expanding at several hundred kilometers per second more than 900 years after the core supernova that created it, emitting visible light, radio waves, X rays and even gamma radiation.

And in the center of the Crab Nebula, beautifully verifying the whole theoretical story, is a pulsar!

For the pulsars, most astronomers firmly believe, are actually neutron stars that are emitting sharply-timed bursts of radio energy.

The first pulsar, CP 1919—meaning Cambridge Pulsar at 19 hours, 19 minutes right ascension—was discovered during the summer of 1967 by Jocelyn Bell and Anthony Hewish of the Cambridge University radio observatory. CP 1919 is in the constellation Vulpecula, the Fox, a faint and shapeless star-group that lies between the bright stars Vega and Altair. Shortly afterward, a half-dozen additional pulsars were found. More are being detected constantly. The Crab Nebula pulsar is designated NP 0532.

When the first pulsars were discovered, their precisely-timed radio bursts led some astronomers to wonder if these signals might not be coming from an intelligent civilization in space. For a few weeks they were informally called LGM signals—for Little Green Men.

But by the end of 1967, Thomas Gold of Cornell and several other theoreticians had proposed natural models that seemed to explain the pulsar phenomenon very well. All of these models dealt with white dwarf or neutron stars. Using Occam's Razor, the more-complex explanation of an interstellar civilization was dropped in favor of the natural-phenomenon explanation.

(Ordinarily, science fiction people should be wary of glib technical explanations that pass by the possi-

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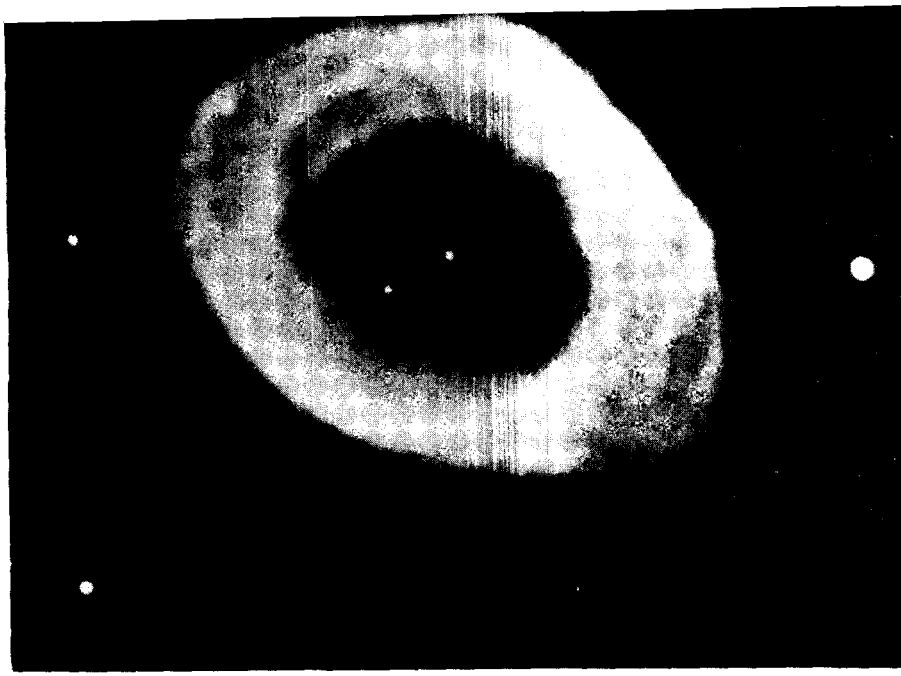

(Mt. Wilson and Palomar Observatories)

Fig. 7. The Ring Nebula in Lyra, presumably caused by a nova explosion that blew off some of the outer envelope of the central star.

bility of other intelligences in space. Too often the scientists are merely whistling past the graveyard. But in this case, as you'll soon see, the natural explanation fits very nicely with the whole gravitational collapse/neutron star sequence. So the scientists might be right after all. This time.)

Gold's explanation seems to be the most widely-accepted at present. He pictures the pulsar as a neutron star surrounded by fairly dense plasma clouds—the remnants of the core supernova, probably—with the whole complex of core and clouds held together by a strong magnetic field. If the neutron star is rotating, which it no doubt would be, its magnetic field's rotation would drag the plasma cloud around with it. However, the farther away from the star's surface you go, the faster the plasma

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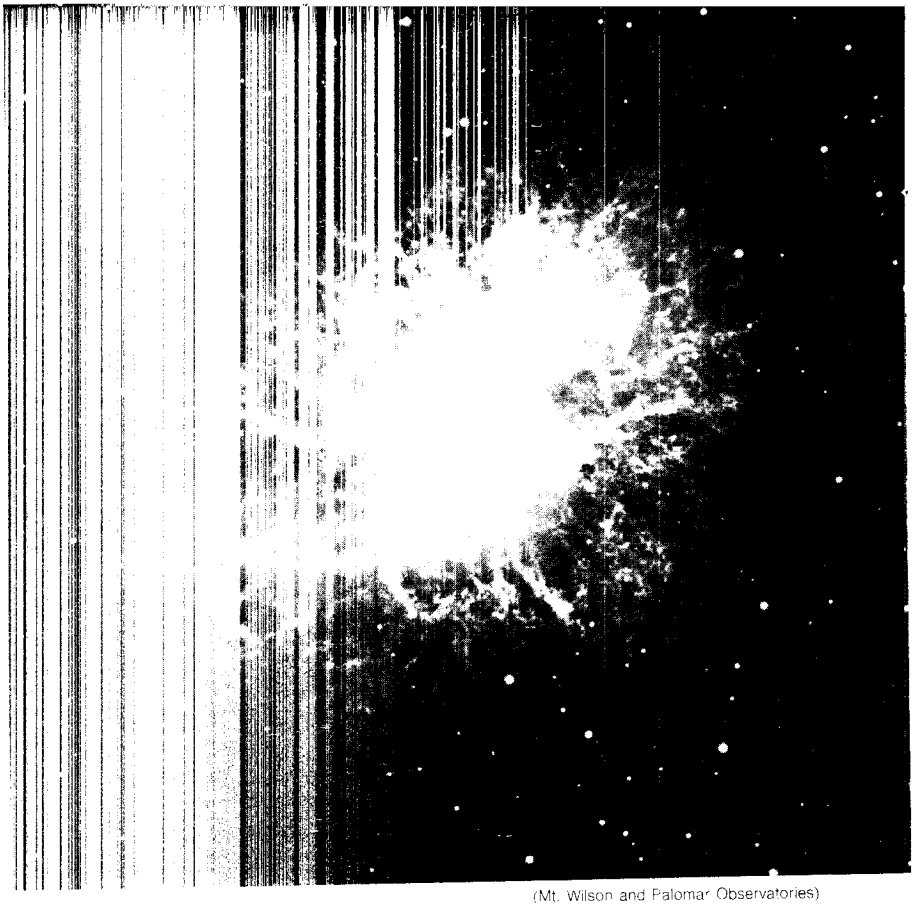

(Mt. Wilson and Palomar Observatories)

Fig. 8. The famous Crab Nebula in Taurus, the result of a supernova in 1054 A.D. The pulsar NP 0532 is at the center of the nebula, and is presumed to be a fast-rotating neutron star.

[illegible] with the [illegible]. This is like a "crack the whip" situation—tail-end Charlie must go like hell just to stay up with the rest of the gang.

At a far-enough distance, the plasma simply can't keep up, even though it may be moving at speeds close to the speed of light. Part of the plasma breaks away from the magnetic field, and in the relativistic processes involved, a beam of radio energy is formed. This happens on every rotation of the neutron star, causing a regular periodicity to the radio pulses. The observed timing of the pulsars' radio bursts—all grouped around the once-a-second mark—fit in well with the expect spin rate of a 10-kilometer-wide neutron star.

Thorne prefers a different explanation. You recall that white dwarf stars may produce explosions on their simmering surfaces—sort of

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super-flares? Thorne believes that surface flares or explosions on a rotating white dwarf might explain the pulsars. The flares would emit a beam of radio waves as well as visible light. But this theory doesn't seem to explain the exactness of the pulsars' timing as well as Gold's.

The discovery of the Crab Nebula pulsar brought enormous support to Gold's explanation. Here is exactly the situation he postulated: a neutron star imbedded in a plasma cloud laced with a strong magnetic field. Early in 1969 the Crab Nebula pulsar was detected visually, photographed, and even scanned by TV. The optical pulsations, in synchronization with the radio pulses, provided even further excitement and satisfaction for the astronomers.

Moreover, for a few of the pulsars, the periods of pulsation are *increasing*. This most likely means that they're still shrinking, still being crushed to smaller size by gravity.

How far can the crush go?

The answer, according to theoretical physicists such as Thorne, is that under the right circumstances a star can literally go straight out of this universe.

Let's take another look at a neutron star. With our eyes of theory we can see through the swirling carnage of plasma that surround the star.

Originally a star of more than 1.4 solar masses, it has suffered a gravitational collapse, perhaps gone through either an outer envelope or core supernova—or both?—and now is reduced to a neutron core with a mass between one-fifth and twice the sun's mass. For several thousand years such a neutron star will emit more X-ray energy than the sun's output of visible light. And as we've seen, it's also causing radio and optical pulses, although these are most likely coming from the surrounding plasma clouds and not from the neutron star itself. After a hundred million years or so, the neutron star's temperature will cool down to a few thousand degrees and it will become a quiet, dark chunk of matter some 10 to 100 kilometers across.

But if the neutron core of a collapsing star is more than twice the sun's mass, its gravitational infall won't stop at the neutron star stage. It will keep on shrinking. As the interior density goes past the ten billion tons per cubic inch mark, the neutrons themselves are squeezed down into smaller particles called hyperons. Classical physics can't describe what happens now, only relativistic physics can.

To paraphrase an old joke, the star digs a hole, jumps in, and pulls the hole in after it!

For once the gravitational collapse goes past the neutron star stage, the star is on a one-way ride to total oblivion. It will disappear from this universe.

If the star's neutron core is more than twice the sun's mass, no possible braking force can stop the collapse. J. Robert Oppenheimer began

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studying this kind of ultimate gravitational collapse back in 1939, together with Hartland Snyder of the University of California at Berkeley. Oppenheimer was soon diverted into the Manhattan Project and later into the ultimate tragedy of the McCarthy era. He never returned to this particular aspect of physics again. In fact, it wasn't until the mid-1960s, when the work on quasars and on supernova explosions both led to the problem of gravitational collapse, that the subject was really reopened for further examination.

As the collapsing star squeezes in on itself, compressing the same amount of matter into a constantly-smaller radius, the gravitational field of the star becomes titanic. Photons emitted by the star must work against the gravitational field to escape the star's vicinity. We saw earlier that a body of 10^8 solar masses would have a gravitational field strong enough to produce large red shifts in the photons emitted.

Now we're talking about single stars, of the order of the sun's mass. But, if the sun shrank down to a diameter of 5.8 kilometers, its gravitational field would be so strong that no photons could escape its surface. The sun would disappear.

For a body of the sun's mass, the *gravitational radius*—the radius at which photons can no longer escape—is 2.9 kilometers. But the sun will never shrink that far, so the computer runs tell us.

For a star with a neutron core of more than two solar masses, though—a black pit is waiting.

It reaches neutron star density but keeps right on shrinking—gravity is so powerful that it overrides everything else. When the star's diameter gets down to about six kilometers, it winks out. Photons can't escape from it any longer. It has dug a black hole in space and disappeared into it.

It's a strange place, this black hole. Because the gravitational collapse doesn't stop simply because we can't see the star anymore. According to theory, the star keeps collapsing until it reaches zero volume and infinite density! Such a point is called a *Swarzschild singularity*, after the German physicist Karl Swarzschild (1873-1916).

More on the singularity aspect in a moment.

We've watched a star collapse into the white dwarf stage, explode, and collapse into a neutron star. What would it look like if we could watch the final disappearance of a star as it collapsed down into a black hole?

First, you'd have to be able to see through the plasma clouds that surround the scene. Second, you'd have to be able to see in X-ray wave lengths, because that's where the star's radiating. Finally, you'd have to look damned fast, for the whole thing happens in less than a second.

The star visibly collapses and becomes "redder" as it shrinks. The

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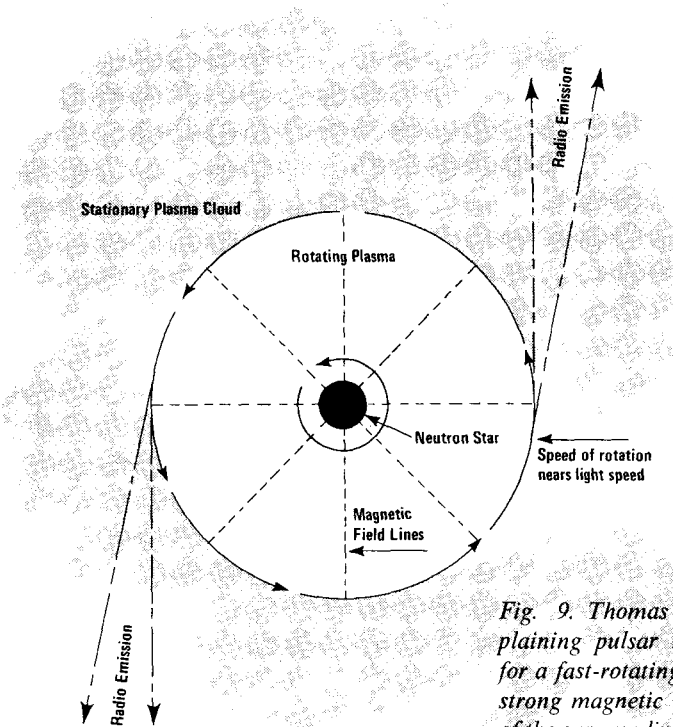

Fig. 9. Thomas Gold's theory explaining pulsar radio emission calls for a fast-rotating neutron star with a strong magnetic field that forces part of the surrounding plasma cloud to rotate in step with the star itself. At the distance where the plasma speed comes close to the speed of light, a bolt of plasma escapes and emits a radio pulse.

photons must work harder and harder to get away from that fast-increasing gravitational field. Perhaps they're even shifted to visible wavelengths. But assuming you can see the star, regardless of the wave length of its radiation, one moment it's hanging there in the midst of its plasma nebulosity, then suddenly it shrinks like a pricked balloon, getting smaller and smaller.

Then—still within the space of a second, remember—the collapse will seem to slow down. A few photons are struggling up out of the rim of that black hole. The star finally disappears, but there's a dim halo left, a few kilometers across, where those last few photons are taking tortuously spiraling paths to work out of the gravitational pit that the star has dug for itself.

The planets around such a star should be safe from falling into the gravitational pit, although any native life on such worlds would have been scoured away during the earlier explosions. We, in a spacecraft, can approach the star quite closely—as close as the gravitational radius itself—without being sucked into the black hole. The chances of losing interstellar spacecraft due to stray wanderings into invisible black holes

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are much smaller than the chances of being punctured by a millimeter-sized meteoroid in our solar system.

Or are they?

Gravitational collapse down into a black hole can also happen for objects larger than individual stars—for whole galaxies or quasars, in fact. The gravitational radius for a galaxy of a billion solar masses would be roughly one-fifth of an Astronomical Unit. With a diameter of some 15 million kilometers, you could fit several collapsed galaxies inside the orbit of Mercury! The gravitational effects on the rest of the solar system might be interesting—if gravitational waves from the collapsed galaxy can escape the black hole.

Even an 0.2-AU "pothole" is microscopically small in the superhighway of interstellar space. But, if a craft should ever hit one, it will disappear forever.

Or will it?

In that strange world inside the black hole, where a star is crushed down to zero volume and infinite density, what physical rules apply? Even relativistic physics has nothing to say when the density gets to something like 10^{88} tons per cubic inch. This is 10^{79} times denser than a neutron star; if the sun were made that dense, its size would be about one-millionth the diameter *of an atomic nucleus.* Nobody knows what happens, physically, down at the bottom of the black pit.

Except that it might be bottomless. Or better yet, open-ended.

Several theoreticians have pointed out that the mathematics of gravitational collapse and Swarzschild singularities apply only to perfectly spherical bodies. Stars are not perfect spheres, and certainly galaxies are even less so. As they're gravitationally crushed, it's likely that any deformations in their shapes will become exaggerated, not smoothed out. Roger Penrose, an English mathematical physicist, has shown that a nonspherical body may collapse down toward a singularity, but would not be completely crushed to zero volume.

For reasons known but to the mathematicians, the body can escape going to a singularity. But it can't stay in the same physical location where it collapsed. In effect, it turns the black hole into a tunnel.

You can visualize this by drawing on an analogy that relativistic physicists have often used. Picture space time as being represented by a thin, very flexible sheet of rubber. We'll picture it as a flat sheet, although actually it's probably curved and may be quite intricately convoluted. Massive bodies such as stars can then be thought of as tiny ball bearings resting on this rubber sheet. The bigger and heavier the star, the deeper the dimple it makes in the otherwise smooth sheet.

For a star, or galaxy, that's collapsing into a black hole, this dimple starts to look more like a tunnel: a long, thin tube stretched in the fabric

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of space time by the gravitational collapse of a massive body.

If the body does not go down to a singularity, then the tube-tunnel might emerge *somewhere else in space time.* The star, or galaxy, has dug its way out of one place in the universe and re-appeared somewhere, and perhaps sometime, else.

No one has seriously proposed explaining the physics of this phenomenon. Where even relativistic physics breaks down, you can't expect more than a shrug of the shoulders when you ask questions. Perhaps the enormous energy locked in the star's gravitational field is the driving force behind its tunnel-drilling. Certainly, at the densities and gravitational field strengths involved, it seems clear that the entire fabric of space time gets badly bent. Dare one call it a space warp?

Some cosmologists have seized on this idea to propose that the quasars are themselves the explosive re-emergence of collapsed galaxies, bursting back into our universe with a loud, bright bang after having tunneled their way out of black pits.

Maybe.

But what are those tunnels like? Do they stay intact, a sort of underground railway system crisscrossing the fabric of space? Could a spacecraft take a shortcut, and maybe break the universal speed limit by going through a tunnel? What happens to time inside of a tunnel?

Ultimately, if the universe is finite, its expansion will slow down, stop, and the final gravitational contraction will begin. Will the universe end in a black pit? Or will we—all squeezed down to hyperons at least—tunnel out into a new and different universe?

Whichever way it goes, it's a long time in the future. For the present, it's fun to consider the possibilities of tunnels through space. Far from avoiding black holes, someday our spacecraft may be seeking them out, looking for the Northwest Passage between here and the Clouds of Magellan. ■

The results of a star's gravitational collapse depends on the mass of the collapsing body. For stars of the sun's mass, electron compression will halt the eventual collapse at the white dwarf stage. For bodies of up twice the sun's mass, the collapse will produce a neutron star. For bodies of more than twice the sun's mass, the collapse is irretrievable: the star will disappear from this universe.

GRAVITATIONAL COLLAPSE

MASS (Sun = 1)	*RESULT*	*DIAMETER*	*DENSITY*	*BRAKING MECHANISM*
1	white dwarf	~ 2,000 km	~ 1000 tons/inch^3	electron compression
1.4 to 2	neutron star	1-100 km	10^9 tons/inch^3	neutron repulsion
> 2	black hole	0	∞	none

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THE SWORD OF CAIN

The inevitable answer
to street crimes against individuals
is individual self-defense.
Which then leads to. . . .

HENRY SAUTER

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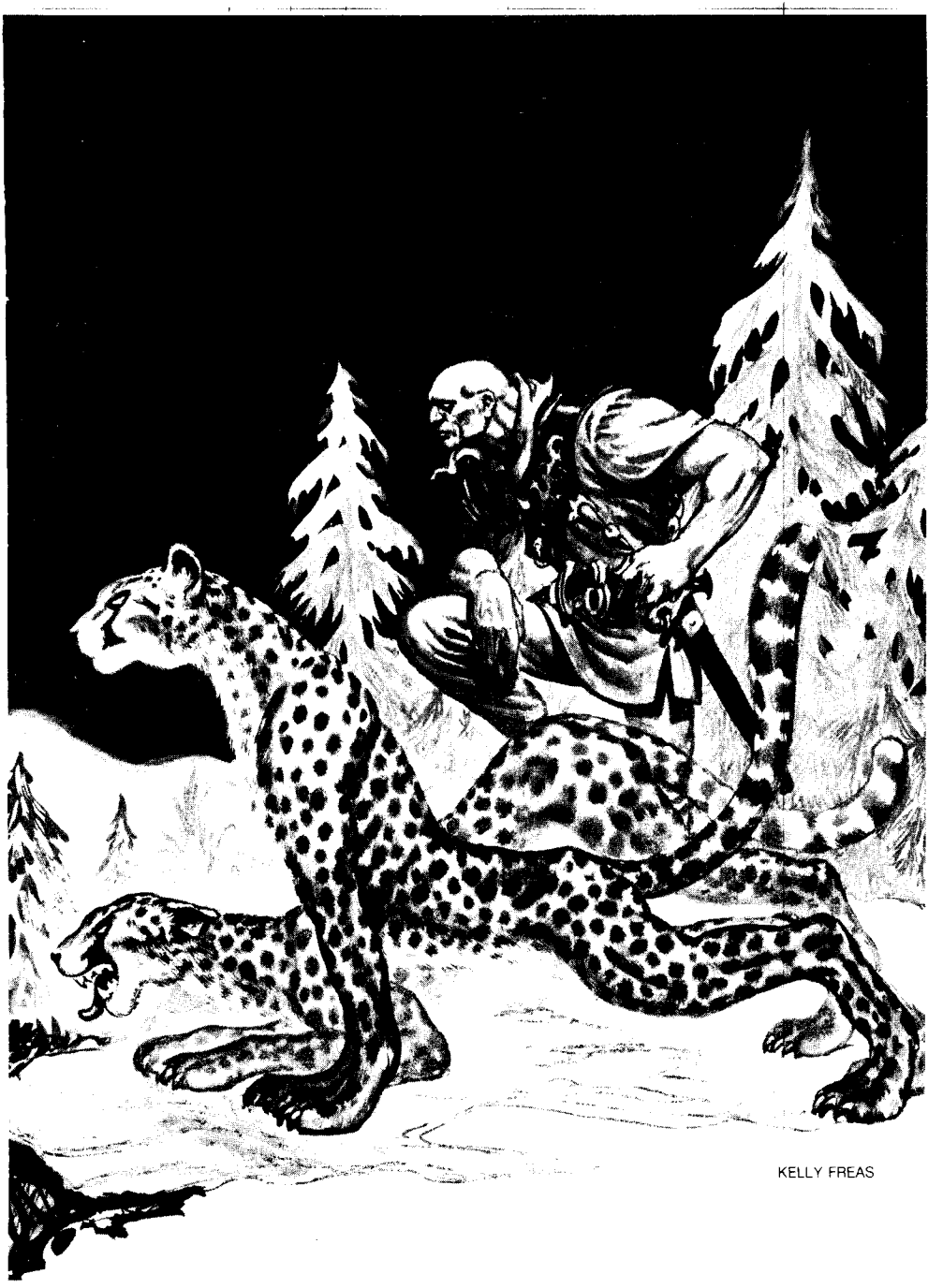

KELLY FREAS

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Simon Kester's faded blue eyes followed Dr. Halon's puffy hands as they removed the sensors from his wrists, ankles, and major nerve centers. Wires from the sensors led to a wall-enclosed diagnostic computer. Halon let the wires retract, leaving only the sensors neatly aligned, ready for the next patient.

"Medicine is now on a par with industry," Halon said while he waited for the quietly chuckling machine to produce the customary thick sheaf of papers. "The auto industry really started it—with comparatively simple testers to locate engine troubles. The advance in electro-chemistry-biology has enabled the medical profession to develop this complete physical analysis machine."

"Seems to me, Industry's still ahead—in the spare-parts line." Simon's voice was harsh. He sat up, donned his tunic.

The doctor flushed, "Births still exceed the death rate. And only from the dead or dying can we get organs, or 'spare parts,' in your words. For every heart, or set of lungs, or arm available, there're two dozen real or fancied emergencies demanding the 'part'. It takes a long time to grow people, and longer until their organs become available for transplant."

"Hear tell there're ways to get parts, you got the money." Simon stood up, still tall but beginning to bend with the years. Bony hands buckled on his harness complete with dagger and shortsword; the banning of firearms in Kester's infancy had brought about the revival of cold steel for personal protection. "Also, hear this . . . Stroud, that his name? . . . can grow new parts from old, without waiting for a death."

"Let's talk this over in the office." Halon jerked the sheets of graphs and data from the mouth of the now-quiet computer.

Simon followed, noting the typical pear-shape of the desk man; the unsteady walk. There was a *something* about Halon, and his shakiness. Could be nerves; when Simon had first entered the office there was a slight lingering smell of exotic perfume. Simon wondered who was behind the door set into the paneling on the right wall.

"Vintage '94, from what was California. Not the best year, but a high alcohol content." Halon handed a glass from the autobar to Simon, took one for himself. "Go ahead, Simon, relax a bit." Halon gulped his wine, poured another glass, sat down to the report.

Simon sipped his drink appreciatively, savoring the mellow-sharp taste. He watched Halon; the shakiness, Simon noted, was leaving the doctor, now. Simon had looked long for a doctor; Halon had seemed the man, but it began to appear the doctor enjoyed the good things of life a bit too much. Simon smacked his lips over another sip of wine, glanced again at the door.

"This place is spy-ray proof; besides, nothing goes out of here." Ha-

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lon looked up from the report, dialed another glass.

Simon shook his head; his glass was still half full.

"Simon, you've somewhere between six weeks and six months to live."

"*That* short?" Simon had expected something of the sort; but in the face of the reality he handed his glass forward for a refill. "Doctor, granted I'm ninety-four; but I've never had a transplant, never spent a day in the hospital. At my age, I don't *have* to wear weapons but I've yet to see a man walk away from a challenge to me." Simon gulped down the wine; already he was beginning to feel the effects; he knew he was talking too much.

"Simon," Halon regarded him narrowly, "ever read 'The One Horse Shay'? I think that's the title."

"The . . . poem, isn't it? Probably way back when, in school. Don't go much for poetry."

"Well, it is about a shay—buggy—that was so well constructed no one part was stronger than another. Came the day, though, when it fell apart—all at once. You're like that buggy. When you go, it'll be all at once. No new heart will do the job, or liver—you need the whole works. You need a complete, live body."

"A *whole* body?" Simon almost whispered the words. Why, a heart, or a hand, alone, would put the ordinary citizen into debt for years. A whole body. Even if obtainable he doubted he had that much money, frugal as he had been all his life.

"While you're thinking, forget Stroud. I doubt he can do as you said—if he could, we of the medical profession would have known of it. And if he can, the Guild will soon put him out of business. They make too much out of spare parts."

Simon knew of the Rocky Mountain Spare Parts Guild; an organization that had grown wealthy and powerful enough so that its openly-hired heavys were engaging in duels, with the Guild using the slain bodies as sources of parts. Maybe . . .

Halon seemed to read his thoughts: "Take my advice and don't get mixed up with the Guild. I did, just once. With Guildmaster Levitt. Took me two years to pay him off—almost lost my Medic standing a few times, over some of his deals.

"Simon, you're physically capable and mentally sharp. Just bring me a nice, young body. I'll do the rest. Brain transplant is one of the easiest; though, naturally, it isn't talked about and not even publicly known."

"What's your price?" Simon knew Halon had him hooked.

"Just bring along another body, for me." Halon laughed at the look on Simon's face. The liquor had brought back the doctor's humor. "I'm tired of this hulk, Simon." He patted his paunch. "Besides, it can't last much longer under the treatment I give it."

Simon believed that; he had seen the effect of the liquor. Coupled with the perfume, Simon made a down-

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ward revision of his earlier estimate of Halon's age.

"And when you get the two, just come here. But remember, Simon, they have to be young—and alive." Halon paused, studied Simon. "It's a deal?"

"Well, *two* seems . . ." Simon trailed off.

"Six weeks to six months. Personally, I'd say closer to six weeks."

"Deal." The words were reluctant. Simon felt he might know how to get one, but to bring two—at one time . . .

Halon stood up, extending his hand, breaking into Simon's train of thought: "My usual office fee." Halon named a figure.

Grumbling under his breath, Simon paid. Then he straightened his tunic, loosed his shortsword in its sheath, and walked out into the street.

Bright sun slashed through the thin mountain air. Simon stood for a moment, letting his eyes adjust to the glare after the cool light of the office. At this upper level of the city, the doctor's office was in a restricted-by wealth area; here, there were even sidewalks that did not move. Overhead the stream of varied-level air traffic flowed constantly, seemingly in a bewildering crisscrossing of flights but in reality rigidly restricted to course, altitude, and speed. From habit, Simon glanced around. The walks were free of pedestrians; no moving vehicles on the street. The freedom from the seething crowds, as well as Halon's dubious reputation, had made Simon seek out the doctor. Here, too, he could park his heli on the blacktop of this upper level; not on some crowded roof-deck. The openness and the wealth of the area made it reasonably safe for a man alone.

Not that any armed man was truly safe. The Guild—and the free-lancers tolerated because their prey could be bought cheaply by the Guild and sold dearly—had heavys constantly on the prowl to challenge. Alone or in pairs they were picked swordsmen, deadly; and, having dispatched their quarry, would have the body picked up immediately by one of the ever-cruising Guild ships. Eventually, the body would be sold piecemeal to a population demanding more and more transplants. Briefly, the thought of finding a victim in the teeming throngs on the levels below crossed Simon's mind; then he dismissed it.

Simon would be of no value—not as parts—and the only problem was that, should he meet Guild heavys, the killers would not know that. In spite of his years, his appearance was that of a man past the prime but with several decades left. One or two swordsmen, he minded not; but in this isolated spot he did not care to run into a hunting party. So he hurried toward the parking lot, and his heli. Abruptly, he stopped at the lot entrance.

On the ground, a ways from his

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copter, lay a heavy; dead, from the slackness of the body. Two heavys masked had a man backed against Simon's copter; evidently, the man had slain one, and was holding the others at bay. Simon stepped back, wanting no part of this just as the heavys drew back, revealing the defender. Instantly, Simon drew his shortsword, raced silently toward the group, holding a finger to his lips to caution the slim, dark-haired youth with bloodied sword. The thought had flashed across his mind that this might be the beginning again; with it, he acted. At the last moment his foot dislodged a chip from the sun-warmed asphalt; the slight sound of its skittering across the blacktop caused the nearer of the two heavys to whirl, sword point raised.

Steel met steel; Simon noted no blood on the other's sword. At the first exchange, Simon was disappointed in his opponent. The heavy was good; he knew all the tricks; and the daggered left hand was a constant threat. But the heavy had not been born with lightning reflexes, nor had fourscore years experience at the game, in the bargain. Simon parried easily on the defensive, while he watched the youth, now definitely on the attack. The boy—he was hardly more than that—was fast; almost as fast as Simon. What he lacked in the polish and skill, that comes from a lifetime of the deadly game, he made up in speed. His sword glinted brightly in the sun, raining blows interspersed with thrusts, keeping the trained heavy on the defensive, driving the killer back.

Abruptly Simon had seen enough; concentrated on his man. He parried skillfully, lunged, and shifted to the offensive. In the abrupt switch the heavy recognized the change. Simon could read the man's foreknowledge of death on the other's face. Simon feinted, leaving himself apparently wide open. As the heavy struck, Simon was aside, then in, with sword-point moving upward through stomach, lungs, and into beating heart. As quickly as he had driven the blade home, Simon freed it from the falling body and turned with dripping steel to the other pair.

The boy struck and slashed, great overhand blows that sparked against the heavy's hard-put blade; then, cat-quick, the boy shifted his attack. He lunged, buried his point full in the chest of his opponent. The man's upraised blade hung motionless momentarily, then dropped to the ground as its erstwhile wielder crumpled. Simon bent, wiped his blade on the fallen tunic, sheathed his sword.

"Move it, *fast!*" A glance around, then upward; a squat, heavy copter without insignia, or marking, was drifting down through the traffic pattern, growing larger momentarily. Without an instant of hesitation, Simon tumbled the youth through the door that, keyed to Kester's body-pattern, opened at his presence. Simon leaped in, threw the

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switch, and shoved the heli upward without the customary warm-up; played with the throttle as the cold engines balked, then settled down to a steady hum. He flipped the viewscreen on, gestured at the large copter settling down in the parking lot they had just left.

"Don't waste time," he muttered as, with the heavys loaded, the ship lifted.

"After us?" Blue eyes under dark brows questioned.

"Yep. Have trouble shaking them, too; they've got the motor and the range on us. We've got a quicker getaway, though; and if worst comes to worst, a couple of surprises, back there." He jerked a thumb over his shoulder. Where in a normal craft would have been a seating area, a bulkhead left just room for the two dash seats. Simon threaded his way from level to level, shifting directions with each change to match the flight of planes that were thick as migrating geese.

"What's your name?"

"Lars." Evidently the boy was as chary of words as he was agile of foot.

"Simon. Simon Kester." No harm in giving his name, Simon thought grimly. "How old are you?" Behind them, and below, the unmarked ship inexorably threaded their shifting course. Simon won to the highspeed lane, hurtling south and west over the Colorado Springs-Denver-Cheyenne city complex that spread west from almost-timberline on the front range to what had once been the Colorado-Kansas line.

"Fifteen."

"Sort of young to be wearing steel."

"Not so young!" Lars flared. "So maybe I can't vote for a year—I had one of them done before you came, and would have done the others, too!" Simon tried to place the accent; it wasn't of the City.

"Normally the Guild won't fight the unfranchised. Long as you wear steel, though, they'll figure you're old enough."

"Yorkopolis, you wear it or wind up in a freezer." So the youth came from the sprawling inter-linked eastern network of cities; a stranger here. It would be hard to trace him. As for the weapons, Simon thought, Lars was right. What few police there were were kept busy in traffic regulation and attempted to enforce the no-firearms law. It was every man for himself, in what proudly claimed to be a highly technological and also cultured society.

Simon studied the viewer. The Guild copter was gaining slightly. He studied the nearing shape, finally determining the probable type of armament it carried. Undoubtedly heavy enough to fight off a couple of police cruisers, if need be. Simon put his craft on a down-glide, poured on full power. By now, they were well over the mountains of the Central Rockies, but still within the limits of the city-state. He aimed for a deep

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canyon between two peaks, piloting breakneck just above the tops of the pines, the crags on either side jutting high above toward the clear brilliance of an afternoon mountain sky. Behind came the hunter, higher now and gaining enough to soon be above them. Simon flipped a switch.

"They've got us, down here." Lars's voice was flat, devoid of emotion. The Guild ship was almost directly above, anticipating their twisting course. From the higher elevation the other pilot could see the canyon ahead, know what the fleeing craft's next moves had to be to keep from crashing into the mountainside. And for a mile ahead, there was no room for side-maneuvering.

"Look straight ahead—see anything?"

"Seems a little hazy," Lars said. "Now—it's gone."

"Not haze." Simon answered. A stream of tracers poured from the Guild ship, to spray and corruscate like molten metal of a hearth from the force field Simon had activated. For what was seconds, but seemed hours, generators whined to keep the field constant against the impact of the 20-mm's; then the spilling of tracers abruptly stopped. Simon flicked the switch off.

"Now, it's *my* turn," he grunted. "Force field off—here goes!" He pressed a firing-stud. A red lance of rocket laced upward from Simon's copter; slowly at first, then gaining speed, it arced toward the Guild ship. Simon flipped the force field on; the haze built up, vanished. He poured power to the engine. The little ship literally shot down the canyon as the Guild ship sought to evade the seeker-missile.

"We're too close," he gritted, knuckles white on the controls. "Got to get around that turn, get the hill between us and—"

The explosion balled fire in the sky where the Guild ship had been. The shock wave hit the copter, just short of the shielding hill; tossed it as a fall leaf in October gale, down into the valley. Lars caught the seat for a moment, then was torn loose, slammed against a wall. Simon managed to hang onto the controls a moment longer. The ship smashed into the pines, plowing a giant furrow through the green. Battered and broken, the ship lay half-buried in the hillside while the mighty explosion dwindled away in fading echoes among the mountain peaks.

Idly, Cain envied the fur on his pair of hunting cheetahs, for the wind blew chill through the valley. The piled snow glinting high in the sun on the peaks noted the foretaste of winter, though the grass in this particular high meadow had not yet been frost-touched. Ahead, the man who had dropped from the now-gone chopper was working up a side slope, scrambling and slipping as a foot slid on a loose rock or a pine cone. City type, thought Cain; first time in the mountains, probably. With a gliding movement Cain drew

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backwards, out of sight of the laboring stranger, and with a soundless command to the cheetahs began a steady trot to the ridge line. The shortsword belted about his tunic moved smoothly with the rhythm of his stride, not slapping as with the ordinary runner. Ghosting along in the cover of scrub and pine came the cats.

Shaded by the ponderosa and blended into the scanty brush Cain listened to the sounds of the climber. An occasional profane ejaculation; the heavy panting of a man not used to the thin air of the high country. Then the heavily-clothed man made his way to the comparative level of the ridge and sank to the ground, breath rasping in his throat. He was loaded with a heavy pack; slung with binoculars, shortsword, and a radio. Across his shoulder was a rifle.

A rifle. Cain reconsidered. Even with his speed, he would have to be careful—he watched as the man shrugged out of the pack and carelessly tossed the rifle on it, to begin working with the radio. Or maybe not so careful; the man had the looks of a heavy. As such, he would not be too used to the rifle; he would go for his sword in a surprise encounter, out of habit. Motionless as the stony outcropping of the mountain itself, Cain listened.

"Silver from Indigo. Silver from Indigo."

"Indigo, this is Silver. Go ahead."

Cain's ears picked up the faint answer from the receiver.

"In position. Any further instructions?"

"Indigo from Silver. Will return for you in two days, unless you find business for us. Silver out."

The man shoved the rifle off his pack, opened the straps, and slipped the radio inside. He straightened, began a slow, circular look of the area. Cain began a silent movement. To the west, the heavy scanned the snowcapped peaks, gleaming white in contrast to the blue dark beneath. North and east, at a lower level and hazed with distance, lay the metropolis; an occasional glint from sun on metal showing through the pall of smog that ballooned to the horizon. He swung east, toward the crest of the hill, and stared into the face of Cain, only a few feet away. Immobile in the underbrush the cheetahs flanked Cain, blending into the spotty patches of sun and shade. For a moment the heavy froze; then clawed his sword from its sheath, dropped into the fighter's crouch. Cain waited, barehanded, until the sword flicked at him like a glinting serpent in the sun, then moved under the lunge, caught the heavy, and hurled him into the brush. Two silent streaks moved as one; a short, choked scream; and only occasionally did a sound of tearing flesh rise above the whisper of wind in the ponderosa.

Cain was at the pack almost before the heavy hit the ground. He surveyed the contents: rations, radio, sleeping bag, and spy-ray. For a mo-

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ment he was tempted to experiment with the spy-ray; then he carefully closed the pack, to leave it as it had been dropped. He wanted no sign of his presence; with frost quite probable any night two days would erase any latent prints of his having been on the scene.

All that would remain would be the torn body of the heavy.

As he stood up, the cats slouched out of the brush. A quick glance at red-tinged muzzles and Cain knew the job was done. He verified this while the cats did a quick cleanup; then the trio moved silently out of the area, down-slope, and to the laboratory-cavern of Dr. Stroud.

Cain and the cheetahs threaded their way through the laboratory to the workroom in the rear of the cavern refuge. His senses told him Stroud would be there; together with the more-than-animals he stood for a moment and watched the elderly doctor busy at the electronics bench. One of the cats padded forward; Stroud looked up.

"You're back." A welcome was in the doctor's voice for the man he had rebuilt from a few assorted bits of flesh. Yet there was a sadness that he had built Cain apart from the human race. In the rebuilding Stroud had bettered Cain, physically; yet he could not add the spark, the soul, of the true human.

"Doctor, there has been two spy-probes in the last two days." Cain's voice was even, devoid of emotion. "On the second probe—today—the copter dropped a man and a spy device in the canyon, to the south." One of the cheetahs rubbed against Stroud; they, too, were products of his rebuild-and-change genius. Retaining the speed and skill of the cheetah, yet they had the size and staying power of the wolf hound. The ancients had used cheetahs in war; Stroud had found his easy to train and highly efficient guards. He stroked the shoulder of the cat, abruptly drew away his hand.

"Blood?" He showed Cain a spot of red wetness on his palm, coagulating to brown. Cain nodded; looked at the cheetahs. For a moment they both met his icy gaze with slitted yellow eyes, then obediently began a thorough washup.

"The visitor was taken care of," said Cain dismissing the incident. "I am certain the probes did not discover anything; our shield was not penetrated." Cain referred to the shielding of the cavern that served Stroud for a laboratory and a home. A force field would bounce back a spy-probe, and be a dead giveaway. Stroud, rather than use a force field, had begun with the principle that every material gives off its own peculiar radiation. From this basic principle, he had produced a radiation camouflage that, under the most intense instrument survey, would appear to be a solid mountain; no indication of the giant cavern or its entrance. The only fear was that somewhere there might exist a

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record of this cave, and that the wrong someone would find the record. With the gradual withdrawal of the mountain dwellers to the city on the false theory of safety in numbers, this seemed a remote possibility. In any event, it would have to be faced when it occurred.

"The last two days." Stroud strummed his fingers on the bench, thoughtfully. "And Lars is two days overdue. Any connection, do you think?"

"Possibly—but improbable. Many things could delay Lars. I think Levitt is looking for you. Or, he could be on a random sweep of the area on the chance of finding victims for his parts-bank. I'm leaving now to check on Lars; I should be back before the copter comes to pick up our erstwhile visitor, in two days. Which reminds me—don't feed the cheetahs; they're full."

"You let them . . ." Stroud looked at the blood now-dark on his palm, wiped it off with hard, short motions.

"Had to leave a valid reason for his death. He was a heavy; would have killed either of us without a thought."

"Death—always death—when I try to give life." Stroud shook his head, weariness in his tone.

"Man is man's worst enemy—except for Cain." Cain turned toward the door.

"Wait." Stroud handed Cain a small pouch-shaped package. "Try this on. You can't take the cheetahs into town, but this might come in handy. Put it on your belt and flick the lever." Cain did so. Momentarily a slight haze formed, to shimmer and disappear. Stroud picked up a small block of metal, tossed it at Cain. It arced through the air, then inches from the big man's form bounced as from a wall, fell to the floor. Stroud picked it up, hurled it harder; the third time he threw it with all his strength.

"It works!" Stroud was jubilant. Cain pointed to his ears, shook his head. Stroud tapped his own sword. Cain drew his shortsword, thrust at the rock of the cavern wall; struck again, harder. This time a slight crazing of the rock showed, ground powder falling to the floor. Curious, one of the cheetahs glided over to Cain, recoiled as his nose hit the force field. The cat pawed, sniffed; then, curiosity satisfied, went back to cleaning his coat.

"Air gets a little stale in there." Cain flicked the field off. "The field seems to 'round' the edge of a sword. If I took a deep breath before turning it on, though, I could stay active from five to eight minutes; longer by a factor of seven if I were quiet and slowed my metabolic rate." He stared thoughtfully at the packet. "How long will this sustain a field?"

"At least an hour. As for air—a simple renewal kit would do the trick."

"Design one into a complete unit. For now, this will serve; I'll take it. I

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just might need a little more help."

"Any particular plans?"

"Check at the port for Lars—or news of him. And I have to see Levitt. I must let the Guild know I no longer do their work." Cain settled the pouch on his belt, checked his shortsword and dagger, and walked with Stroud into the laboratory. The vast cavern was filled with aquarium-like tanks, each connected simply to the complex machinery in the metal bases with a few tubes and wires. Stroud stopped at one, containing a pair of hands. Small hands; those of a child.

"Remember Lars's little nephew—the night in the gully?" Cain nodded; an ambush, initially foiled by Stroud, had saved the man, woman, and child who were seeking Stroud's aid. Cain had arrived in time to prevent the capture of the entire group by the Guild. And that night Cain had decided to sever his connection with the Guild and work with Stroud.

"Well, he'll grow up with only memories of the stumps he now has—when we make the graft, next month." Stroud was quietly pleased. The doctor had taken cells from the infant's arms, and grown complete, new hands. Without waiting for another child to die; or, as was becoming increasingly common, to be murdered.

"That is why Lars is coming. To work with you."

"With us."

"No, you," Cain corrected him. "I am Cain—with all the dark connotations from antiquity in my name and my work. Death is my realm—not life. I could no more pursue a complex, long-time study such as your work than could the cheetahs. You, who changed me while giving me life, should know. I serve in my way. Lars, Lars can take your side and eventually your place. He, too, will need the assistance I can give. So now—to find Lars. Also, perhaps, work as fits my name."

Cain made his way directly to the desk of the line on which Lars was scheduled to arrive. The sallow clerk behind the counter briefly thumbed through his manifest list, affirmed Lars's arrival.

"Did you notice if he was met?"

"All I know, papers say he got here." The clerk made a gesture, looking beyond Cain. Cain half-turned, instinctively picked out the two heavys from the milling concourse crowd. They headed for the desk.

"Having trouble?" One asked the clerk. Studiously, they both avoided looking at Cain.

"This gentleman seems to be curious." The clerk nodded at Cain. So far, thought Cain, all was within the code; nothing had been said that could lead to challenge and duel. He recognized one of the heavys, thought quickly. The two turned toward Cain. The eyes of the one widened slightly; recognition was mutual.

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"Guildsman Cain!" Abruptly, the heavy swung back to the clerk. He reached across the counter, grabbed the clerk by the tunic, and jerked him halfway out of his cubicle. "Now, talk! If Cain wants answers, give!"

"Wh . . . what do you want to know?" If possible, the clerk's face was grayer than before. The clerk had his tunic pulled tight around his chest; all he could do was strain for breath and look straight ahead.

"How was he dressed?"

"Green tunic . . . gold-brown harness . . . shortsword and dagger."

"How do you remember?"

"One so young . . . to be armed."

Cain sensed truth in the words. "Was he met?"

"No. But after he checked in, he was followed—I think." The clerk straightened his tunic; the heavy, getting cooperation, had dropped him. The clerk pointed. "He went across the main concourse—out that door—followed by an armed man, dark, tall. Silver-gray tunic."

"Anything else?"

"Might ask one of the porters at that door if he took a cab. Don't pay too much, or you'll get a story to match your money." He looked curiously at Cain. "Say, who are you, anyway?"

"Call me Cain." Cain turned to the heavys. "I am in your debt for the time. Tell Guildmaster Levitt I will see him—perhaps today, perhaps tomorrow. Tell me—the silver tunics. Have any of the Guilds changed to silver?"

"There's a freelance outfit, taking to silver," the heavy answered. "Levitt deals with them—sometimes. They operate from here, and are growing." The heavy thought a moment. "The two of us are assigned here to the line, but could we obtain any help?"

"Borland—you're Borland. Won the Games last year." Cain thought of the use to which this man could be put, shoving down the animal instincts that told him to get back to his flier and out of the City. Borland was a great swordsman, and of all Levitt's heavys the only one Cain felt was out of place. He noted Borland's pleasure at the recognition. "When I see Levitt, I hope you are there."

"I'll be there." As Cain turned into the milling crowd Borland turned to the clerk.

" 'Who are you, anyway?' " Borland mimicked. "That was Cain. Remember him. If I hadn't recognized him, it would be the blood of all three of us on the floor being cleaned up, now. 'Cain' fits him rightly. All the death in the world is wrapped up in that man."

By dint of judicious bribing, Cain found a direction, even though his informant was nervously glancing around and talked in a low voice. Cain took the moving-walk, not waiting for it to carry him, but working his way around the passengers as he moved catlike to hurry his chase. There was a nagging sense of danger in his mind; a feeling that something was not quite right. Full danger

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sense came as two men crossed his path. One purposely shouldered into Cain, cursed; in a moment there was a cleared area around the three. Cain noted the silver tunics. These must be free-lancers. Had the porter put them on his trail? Without wasting time the profane heavy went for his sword; the other stood back, watching narrowly.

Cain waited until the other's weapon was clear of sheath, then his own sword seemed to flow into his hand. Without moving from his loose stance he parried the thrust, beat the steel aside, and slid his point into the throat of the silver-tuniced killer. Before the man had crumpled to the walk Cain whirled, faced the second.

"Do you take his part?" Only after Cain's words, did gasps and murmurs come from the crowd, the affair had ended so suddenly.

The heavy glanced from his fallen companion to the blood-dripping point of Cain's steel. "No. It . . . it was his own affair."

"You lie. You were sent to kill me." Flat statement; the crowd fell silent. Silver-tunic's face whitened; hand gripped hard on his sword hilt, but he fell back a pace. Cain considered. He would have to kill the man, but first he had to make him talk.

"Not as easy as a young boy, am I?" Cain taunted.

"I'd nothing to do with that." The other was sullen.

"Where is he?"

"I don't know—he got away in a flier, southwest, last I heard." The man spoke reluctantly, eyes on Cain's sword point.

"I think you lie." Cain had his information; Lars was alive. And Cain couldn't let word of his knowledge be carried back. The direct statement should have produced a reaction; Cain went the final step. "I challenge you."

The heavy looked desperately around, for some sign from the crowd, but met only the cold glances and sneers given to cowards. Cain shrugged, relaxed, lowered his sword and half-turned to glance down at the fallen man. In that instant the silver-tuniced free-lancer leaped, dagger out, full at Cain. Cain had given the opportunity; the heavy took the bait. Cain met the leap with a cat-twist, bringing his sword point up as he moved his shoulder under outstretched dagger, driving his blade upward through stomach and lungs. Freeing his blade, he stooped and wiped the blood from his steel on the tunic of the coward.

"If anyone cares to obtain the authorities, I donate these two bodies to the public." A ripple of approval ran through the crowd. An elderly med-tech pushed to the front, nodded to Cain. Cain turned and left through the lane that magically opened for him in the crowd.

"Been expecting you, Cain." Sam Levitt stared from under bushy brows when Cain entered the long conference room and paused as the

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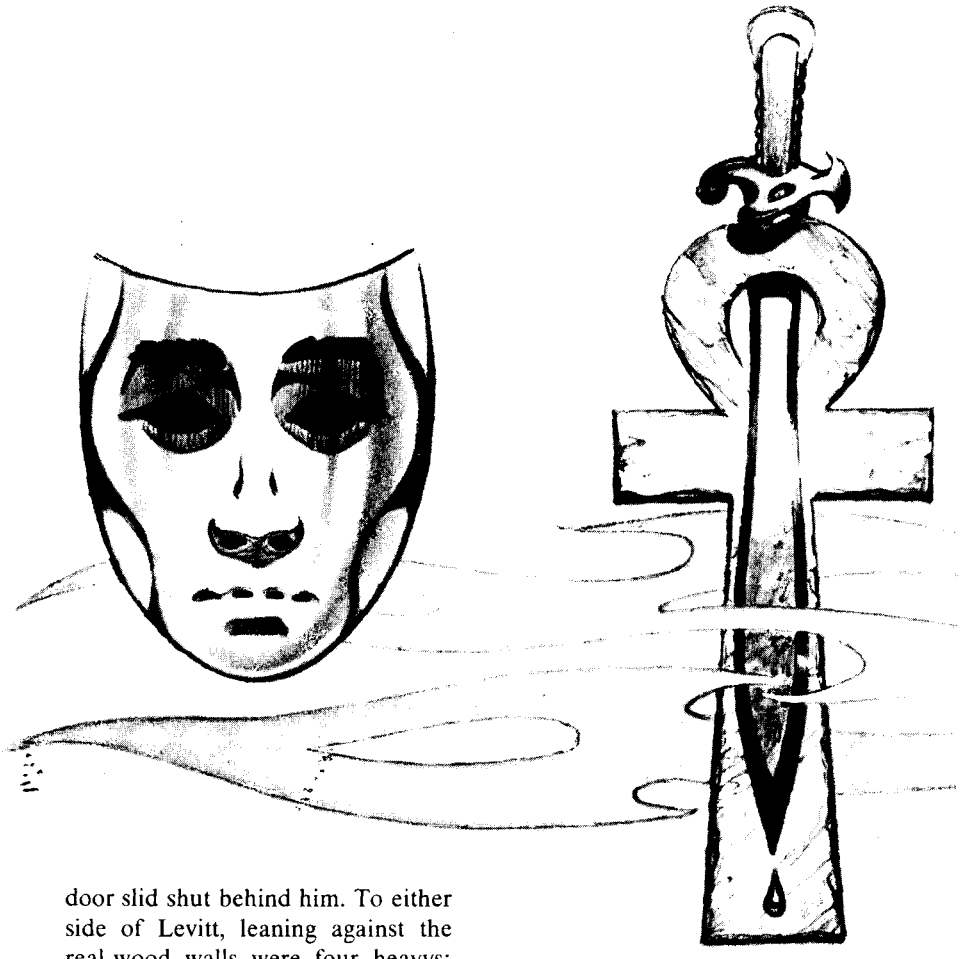

door slid shut behind him. To either side of Levitt, leaning against the real-wood walls were four heavys; Borland, studiously paring his nails with a dagger, among them. The room smelled of danger. Borland's attitude confirmed it. Levitt flipped a switch; a haze showed momentarily between Levitt and Cain, then the force-field trap was full on, clear. He knew from the past that the field blocked the door; there was no turning back. A pressurized hissing, almost inaudible: gas! Cain glanced down at the thick pile of the rug. It would hide the thin gap the force field would make between his body and the floor. Good he had brought it along and that Stroud had developed it in time. Slowly, he turned. With his back to Levitt, he flicked the field on, then completed his turn as if, having surveyed the trap, he wished to face Levitt.

It all depended on timing now. The field he was in would not let the

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gas through. As the extra-wide spectrum band of his eyes picked up the tendrils of gas, floating in the air, filling the space around him, he slowly sank to his knees, fell full-length on the floor. Cain turned his head slightly, to watch through slitted eyes for the approach of feet when Levitt would lift the force field.

Levitt must know or suspect that Cain no longer was of the Guild. Well, it would be all-out war, now; started by Levitt, when Cain had come in peace. Within the force field, Cain could not hear the soft sighing as the pumps removed the gas. After a long ten minutes by heartbeat count, a foot moved into view. How many would join it, he neither knew nor cared. In one motion he flipped off the force field and exploded to his feet, sword and dagger drawn.

Momentarily frozen in front of him were two heavys, carrying chains. Behind them, around Levitt, were six more. Mercilessly, as Levitt's hand reached again for the switch, Cain's sword found the heart of one heavy while the dagger in his left hand buried itself in the other's stomach. As he withdrew his sword, the chains fell from the heavys' dead hands, tearing the pouch from Cain's belt. Air was beginning to haze: Levitt had started the force field! Cain lunged for the barrier with all his strength, slowing, drawn almost to a halt by the building resistance of the field. And the heavys by Levitt began drawing swords, fanning out toward him.

The sound of the explosion high in the air died away; echoes from the hills finally falling silent. Only the

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wind sang gently through the branches of the pines above the fallen copter. Inside, Simon stirred, tried to raise his head, fell back again against the slanted wall of the cabin. He tried again, carefully. Crumpled against the back bulkhead Lars moved slightly. Simon gingerly found his way to his feet, noted the movement in Lars. For himself, bruised only; no bones broken. The boy, though—

"Rough landing," Lars raised slightly, voice shaky. "What happened?"

"Caught in the shock wave." Simon helped him up. "All right?"

"Better by the second." Lars moved carefully. "Only battered. Where do we go from here?"

"Not far. We'll have to blow this job; can't have the Patrol find a weaponed craft here, close to home. Might come around, ask embarrassing questions." Simon flicked off the still-active force field, waited for the ship to settle to the ground, then pinpointed his location from the surrounding peaks. He opened a door in the bulkhead and disappeared. A few moments later he came out, hustled Lars through the door to drop to the ground. Simon checked his watch.

"About twenty minutes—and under good conditions, we can get around the hill up there before that. Follow me—hurry!" Simon set a quick pace on the upgrade of the valley, working on a slant through the underbrush. He had to be around the outthrust of mountain he had termed a hill before the atomics obtained the critical mass necessary to blow. He had removed the dampers sufficiently to allow somewhere in the neighborhood of twenty minutes; the hill ahead would give protection from the shock wave.

"Clear," Simon gasped, breath rasping in his throat. They had rounded the hill and were protected by the mountains. He looked at Lars, who was breathing hard.

"Altitude," Simon told him. "We're about eight thousand feet—air's pretty thin."

"Not used to it." Lars gasped. "Yorkopolis . . . almost . . . sea level."

Then the explosion was mind-filling, and the wave passing through the valley whipped and tore at them with its side effects. Simon got to his feet even while trees were still falling in the force of the blast. The hunter ship exploding might not be noticed; the second, his own ship, was sure to be checked by the Forest Patrol. In two hours of reasonable going they could be at his hideout, some five miles away and fifteen hundred feet higher. There, he could welcome the Patrol—but not here. And Lars wouldn't be likely to know the uniform of the Forest Patrol. It just might work out, sooner than he had expected.

"Ready?" Lars nodded, saving his wind. Simon took the lead threading his way through the trees. His long

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life in the mountains had taught him that usually the easiest and quickest way to make time was to crisscross the slope, not walking or climbing directly up, but following the easiest lay of the land that led upward. Again, he knew this valley. Once a startled deer leaped from almost underfoot. Simon waited impatiently while Lars, wide-eyed, watched its bounding course.

They were both breathing hard, sweating, in the chill mountain air. The sun was well down behind the western peaks, but reflecting brilliance from the snowcapped eastern range. The valley was in shadow as they finally came to a road. Simon stopped momentarily, looked both ways, listened. Nothing but the wind in the trees, singing the song of the high pines as it wafted the perfume of ponderosa to their nostrils.

"Over there," said Simon, pointing to the darkening trees across the road.

"How much farther?" Lars made out a side road leading off the paved highway.

"Quarter mile." Simon stepped out of the forest. "Stick close to me—real close. Don't get farther back than three feet; traps."

They entered the side road, which appeared to be a simple turnaround. Simon strode confidently across, stepped out to the fall of a ditch beyond. Lars, immediately in his wake, had an eerie sense of walking on air when he looked into the pseudo-ditch of the fake turnaround. They passed completely through apparent trees, bushes; a boulder of granite turned out just as passable. Through the boulder, and a gravel drive led to a house, long and low and dark—just made out in the gloom. Lars felt an unease; Simon spoke.

"Stay close—closer. Look to your left."

Lars looked; a small tube emplaced in the rocks was methodically tracking them.

"Laser," Simon explained laconically. "Got it puzzled—two of us, and it can't fire because I'm too close. If you were alone, though . . ." No need for Simon to finish.

Lars got the import. The unreal woods; the weapons; all tuned to Simon's body. If Simon left, Lars would be a prisoner.

"All clear, now." Simon cut short his wondering.

They were at the circle drive, inside the neat boundary fence. Subdued lights came on lighting the path to the house, the landscaped yards, marking the helipad. A twin to the ship in which they had flown was outlined in the light.

Simon answered his look. "Live alone; keep a spare copter. Glad I did, now." He flung open the door and the living room foyer lighted. "Bath's that way, kitchen over there. You clean up, get something to eat. I've a little checking to do."

Abruptly, Simon froze. Above the sound of running water in the bathroom came the sound of a fluttering copter, above the house. Quickly,

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Simon made his way to the call box in the hall, waited. He turned down the volume when the screen lighted and a strong, tanned face over unmarked forest-green tunic came into view.

"Forest Patrol. Request permission to land and talk to you."

"Permission granted." Simon probed into the sides of picture, scanned the interior of the copter. The forester was alone. And young. He flipped off the switch just as Lars came into the hall.

"Trouble, Lars. Ever use a stunner?" Simon pulled a handgun from the drawer. "This has a variable beam—it's set to stun, not kill. If there's trouble, I just want to capture this visitor."

"I can use it," said Lars, frowning. "Think we've been trailed?"

"Maybe. Or it might be a stranger asking for directions. I'll go down and meet him. If I run my hand through my hair—like this—nail him. Then we can disarm him and question him later." Simon led Lars to a recess just outside the door, a shadowed nook. "He won't see you from here." Simon started down the walk.

The copter landed, the forest green gleaming in the groundlight. A lithe, tuniced man leaped to the ground, adjusted harness and sword, and strode toward Simon. Heart pounding, Simon calculated the distance, the angle. The forester opened his mouth to speak, and Simon ran his hand through his hair. The stun beam flashed dull and wavery through the air, enfolded the green-clad man in a golden aura, then flicked off as the forester fell to the ground. Good thing uniforms differed, different regions! And that Lars was tired, confused, and rushed!

"Did I do all right?"

"Fine." Simon took the stunner from Lars, who was staring at the man on the walk. "Now, carry him to my copter."

Lars started for the fallen form, stopped abruptly and swung around to Simon. "I thought you wanted to—"

Simon fired; the golden aura surrounded Lars, and the boy crumpled on top of the forester. Simon sighed. Now he'd have to carry both to the copter. But he didn't dare take a chance. Simon was tired, and Lars was young—and a hurled blade was as fast as a stun beam.

Well, Halon, I've got the two bodies, he thought. Now to get a bundle of credits from the house—and to make a telecall.

Simon loaded the two unconscious bodies into his ship, then, panting from the exertion, went to the green forestry craft. It took some time to locate the flight-recorder, that marked time, direction, and flight of the craft. Simon tossed it out of the copter. He set the autopilot for a western bearing, high enough to clear the surrounding peaks but not those in the rising ranges to the west.

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Starting the motors, he waited until the craft was lifting, then leaped to the ground. The forest ship rose lightless into the dark, and shortly even its sound was gone.

The flight to the city was into a growing bowl of light, a single light from the distance that on nearing turned into individual flashing lights of signs, the brilliance of street lighting, and the movements of vehicles. Red and green lights filled the air in a constant stream of aircraft. Checking his bearings, Simon dropped from the fast level to slow, sought out the parking lot near Halon's office. Landed, he checked to make sure his unwilling passengers were secure, then, setting the safeguards on his ship, made his way down the street.

"You again." The doctor was in a dressing gown; as Simon stepped in past him he caught the lingering of perfume. Apparently, he was spoiling the doctor's evening.

"You said to come back when I had—" Simon broke off at Halon's motion.

Halon crossed into another room, closed the door behind him. Listening intently, Simon could hear the sound of low, urgent voices; then the closing of a door. In a moment Halon reappeared, a frown on his face. "Where are they?"

"In my copter—in the parking lot."

"Right out in public?" Halon's puffy face whitened. "Get out of here—you must be insane! I can't afford to have them found, and you connected to me . . ."

"Just zip up your tunic, Doc. It was your idea from the start. You figure how to get them in here." He waited while Halon thought.

"All right. Just behind the office, there's an emergency pad. I am a doctor, after all. You bring them in, then go park in the lot again. I'll be waiting with auto-stretchers. It will look like an emergency, if anyone is spying." Halon looked at Simon. "I've the spyshield on, in here; had it on when you came. You know, you spoiled the evening."

"Wait 'til you see what I've got," Simon grinned thinly. "It'll make up for a thousand nights."

It was short work to bring the copter to the landing pad, discreetly illumined with the emergency flashers, and Simon parked the copter back in the lot. When he returned, he found Halon sliding the forester into a deep-freeze cubicle. Simon raised an eyebrow.

"I'll need help on him—and I don't think you could do it." Simon had to agree.

Just before Halon gave him the anesthetic, Simon had a thought. "Halon, just make sure the boy's brain goes into this body."

"What? That's ridiculous, Simon. Why—"

"Who'd believe him, if he talked? Besides, it'll give him a few months of life—if he lasts that long. I'll drop him off in the forest—a long way out.

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If he's found alive, he's just another crazy old bum; if he dies, it'll look natural."

As Simon faded out on the table, his last thoughts were of Halon's tricking him. But in the past . . . Blackness closed in.

Lars woke up, uncomprehending. Bright sun glinted on waxy bull-pine needles; the scent of the forest filled the chill of the air. He raised a hand uncertainly, caught sight of it, held it rigid. Gray of skin, stretched tight across the bone; blue of age in the heavy fingernails. His brain recoiled; then the truth sank home. He began screaming.

Cain hit the building force field with one shoulder, impact like that of hitting a brick wall. His tunic ripped from the compression; he felt the field building as he forced through, the sensations of atoms trying to wall one part of his body from the other. The shortsword was torn from his hand; then he burst through. Not pausing, he hurled himself at the center heavy. With one hand he hurled the man full onto the lunging sword of another; the two bowled over a third. Cain brought his dagger in under the thrust of the one on his right, buried the dagger to the hilt in the man's chest. As the heavy slumped, Cain caught his falling sword, whirling light as a cat to face the fifth.

So Levitt would cage him, chain him like an animal! Then, he'd be an animal the Guild had never seen! As his sword bit deep into the heavy, he glanced toward the Guildmaster, in time to see a wall panel sliding closed. Levitt was gone! Borland leaned idly against the wall, watching narrowly, taking no part. Raging, Cain swept toward the two who had been tumbled to the floor. They were on their feet, now, the sword of one red with blood of the man Cain had hurled aside. Cain gave them no time to fence; like a whirlwind he was on them, reddened steel flashing, beating down their swords, driving through to flesh. The last heavy took a step backward. Cain dropped his sword, came in under the man's guard, lifted him and hurled him against the wall. The real-wood wall splintered; smoke spurted as the man's body shorted hidden electronic wires, then dropped to the floor. With a bound Cain was at the panel Levitt had gone through, feeling for the catch.

"No use, Cain," Borland's even tone brought him back to reality. "I tried—he's blocked the panel."

"You're with me?"

"Yes." Borland met the ice-gaze. "After this, I have to be." Levitt would remember that Borland had stayed aloof from the battle; Borland would be marked for death. And, Cain remembered, Borland had always disliked the role of heavy.

"There's a way out." The heavy Guildmaster desk, an affair of solid oak, weighing well over three hundred pounds, met Cain's gaze. Mus-

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cles writhed, twisted through torn tunic as he heaved it overhead, balanced it, and started at a trot toward the wall panel. Borland's eyes widened as Cain bunched his muscles, then with all his great strength hurled the desk. The panel crumpled as cardboard before a driven golf ball, and the way was clear.

"One minute." Smoke was acrid in the room, now; the shorted circuits had begun an electrical fire. The force field had shorted out. Cain made his way through the swirling smoke, retrieved the pouch torn from his belt, and rejoined Borland. Outside the panel, the smoke had not yet penetrated to the escape-stair, leading to the roof deck. Cain cleared his lungs, breathed deeply. Followed by Borland he raced upwards, found the roof scuttle locked. He was drawing back for his second lunge at the unyielding barrier when Borland caught up, panting.

"Here," Borland handed a strip of metal to Cain. Cain slipped it into the slot; the radiations activated the lock and the door swung open. Wind swept the roof deck, used as a copter pad. Far down the line a copter was warming up, rotors turning slowly. It was Levitt's ship; just maybe—Cain burst into speed as the ship began to lift, gathering height as Cain neared. A desperate leap; his fingers touched the landing skid, caught, then slipped off. Cain dropped back to the deck.

"Duck, Cain!" Borland's voice was urgent, above the wind. A stream of forbidden bullets tore into the deck where Cain had been. He was under a parked craft, shielded from the line of fire. Then the Guild ship was gone, fading into the complex swarm of traffic over the city.

"We'd better get out of here," Borland came up, panting. "There'll be a swarm of firemen here, shortly."

Cain nodded, animal rage gone, now, but for the sullen hatred of Levitt buried in his mind. He had come in peace, to offer a possible solution to the clash of Stroud's work with Guild money. Should the Guild protect Stroud, further his work, murder would cease and the results would benefit not only man but bring legitimate money into Guild coffers. Now, he must eliminate Levitt—and, the Guild. Briefly, as they floated down the grav-shaft to an obscure street some fifty stories below, Cain told of his search for Lars; the fact that the search had taken him to the medical area, and the story of a possible flight to the southwest. Borland listened while he steered Cain into an automat and dialed meals for both.

"Then I'd say, let's finish finding Lars." Borland ate slowly, while Cain tore at his food. "I've a copter—armed and equipped with the latest electronic gear—and if he didn't go clear off the continent I think we can find him."

"Levitt," the word was flat.

"He can wait. He had nothing to

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do with Lars—I'd of known. Nor did the Guild."

"Borland, how'd you ever get into this?" Cain wolfed down the last of the meal, studied, without seeming to, the members of the crowd drifting by on the auto-walk.

"Might ask you the same, but it would probably take longer." Borland laughed. "Well, I liked ancient history, taught it. And being brought up in this era, where the sword had come back to its own, I naturally studied the art of fencing, and all I could about the ancient methods of fighting. In time, I became a competent swordsman."

"An understatement," Cain interjected.

"One of the college alumni offered to finance me at the four-year gladitorial contest. As you know, of the whole Olympics, there's only one medal in *that* event." Borland paused, soberly, thinking. Cain had been fascinated, yet repelled, by the gladiatorial games. The best swordsmen of the world were pitted against each other; the point system was based on blood. The winner of a match was seldom unscathed; the loser, dead or dying.

"Well, about the fourth match—you know how long the eliminations take—I was sick of it. But I had to go on. The senselessness of it wasn't nearly as bad as the crowds, screaming for blood. A Roman holiday, for sure." Borland chewed on the last of his syntha-steak, reflectively.

"I went through the rest as in a dream, and won. Instead of dragging it out, I usually finished my opponent in from thirty seconds to a minute. Unfortunately, most of them died; I tried only to wound, but they bled to death. Medical attention isn't for the losers, in the games."

"Why didn't you go back to teaching? Any college—"

"Any college would have nothing to do with me. I was a professional killer, now. It seemed every half-drunk with a penknife challenged me. I had to eat, so I took an offer to work as a heavy." Borland looked at Cain. "Now: what do you have to offer?"

"Death, quite probably. Or, alternatively, life. Life for mankind."

"Sold. My ship's not far. I'm fairly sure Levitt doesn't even know it exists." He rose. "Should we go?"

Originally a four-place job, the ship had had three of the seats removed, their places filled with electronic gear. Cain crouched in front of a scanner as Borland flew over the medical center, then eased upward into a medium-speed level, bearing southwest. Cain noticed his yawn.

"Why don't you lie down in the aisle; get some sleep. I'll take over from here."

"How about you?"

"I'm good for two-three more nights; then I'll get a catnap."

The sun was breaking through the gray of the east as Cain slid into the pilot seat, swung the scanner for an easy view. They were past the limits of the metropolis, now; the moun-

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tains were becoming more rugged. Anything of importance could be better seen on the large scanner. Cain lifted the craft high in the air. For something like two hours, he cruised slowly, then slanted down for a look at the ground.

"Find something?" The change in flight had wakened Borland.

"Maybe. Broken trees—looks like an explosion, in that canyon, not too long ago."

"Only a day or so old," Borland studied the screen.

"Could be Lars, only that's from a clean nuclear blast. Information I had he was on an ordinary ship."

"Then maybe it was the free-lance copter; it was atomic." Borland worked a while with his equipment, shook his head. "Nothing the size of a man alive, down there."

"We can always come back here. I'll keep this bearing a while longer."

Borland nodded and was asleep again before the craft had lifted peak-high.

With his attention on the flight and the screen, Cain still put another part of his mind to work on the curious problem of humans. Himself, reconstructed and drastically changed by Stroud, he did not consider a member of the race of man; he was closer akin to the cheetahs. But Borland: probably an excellent teacher, but forced into killing and the traffic in parts of the human body. How many men, he wondered, had a real chance to use their talents? Man had to work out its own destiny. On the other hand, Cain could be the aberrant factor that would allow Stroud to set mankind on a course other than murder. Abruptly weary of the complexities of the problem, Cain automatically piloted and watched the screen.

"Going down."

Some two hours later Cain's words brought Borland upright, staring at the screen. A man was making his way in the direction of the city. He was moving slowly, in a straight line, and a sheer cliff rose in front of him. Borland ran up the magnification. "Looks beat."

The man was old. Now and then, he stumbled; regaining his balance, he headed the same course.

Cain feathered to a whisper, dropped the ship into the clearing behind the man. For a moment, the ancient looked at them, turned, tried to run, and fell over a log.

"All right, old-timer," Borland was gentle. "We want to help."

"Eighty—eighty years too late!" Suddenly, the figure in Borland's arms was sobbing. Cain took in the stained garments, worn with woods and underbrush; then abruptly stepped forward, ran a finger through the gray hair, traced a circle around the skull. Ice eyes looked at Borland; then Cain was at the ship, returned with a flask of water and a packet of food concentrate.

"Here." Gently he forced the man's head back; noted the gray skin of age under the weatherbeaten

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brown; forced the man to swallow. He took the water away, and the man looked at him with rheumy, bloodshot eyes. It couldn't be, but—

"Don't talk now. Another drink; chew on this; then talk." To Borland, he said, "We've found Lars."

"Lars? I thought Lars was young—"

"I'm Lars." The ancient spoke around the food. "Brain, anyway. Body . . . body belongs to a man named Simon. He—" Lars choked, broke into a fit of coughing. Finally he steadied, took a drink of water. "When I got to the city, I checked in at the manifest desk, then called a cab. I wanted to get to a scrambler-phone, but the cabby let me out on a side street and took off. Three silver-tunics attacked me." Slowly, he recounted what had happened. "So—Simon has my body, and another lifetime ahead of him. I'm due for death, in a short time; this body can't last long."

"We'll get your body back," Cain said.

Borland had been listening in horror. Killing for parts was bad enough; but what kind of a fiend would do this?

"We'll start with Halon," Borland said grimly.

"No." Lars spoke. "Go back to the blast area—once there, I can guide you to Simon's . . . my . . . place." At the doubt on Borland's face, he went on. "I can always return where I've once been. Once at the hideout, this body of Kester's will be the entry key. And he is bound to come back.

"All we have to do is wait."

Simon Kester, still full of dream-dust, left Madame Kelso's realm of pleasure and swayed down the auto-walk toward the parking ramp. His youth, newly found in Lars's young body, had given him a night he had never thought to live again. The credits he had lavishly spent promised an open door on his return. Now, back to his home and rest; then, with more money, he would return. He had a lifetime to live again. With the wisdom acquired in one, he would have no trouble acquiring even more wealth than he had.

"Never drink when on the dreamy," he giggled as he climbed into the copter, pulling a flask from his pouch and tilting it up. "Fine for old men—but this body can take it!" Already, he thought, as he set the autopilot and headed into traffic, his brain was feeling younger, thinking younger. Have to check on Halon—say in a couple of months. See how fast that strong forester's body would get soft. As the copter automatically feathered, dropped to the landing pad in front of his house, Simon took another drink from his bottle, laughed foolishly. That little brunette, now—maybe he'd bring her back, next time. She'd wanted to come now. But maybe he'd find someone better, next trip.

Simon stood up unsteadily, opened the door. Something wrong

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with the automatic mechanism—he'd have to fix that. He dropped to the ground.

As Simon's craft came in for a landing, Lars rested the stun-gun against the door frame. Behind him, in the house, Cain and Borland watched. Lars forced himself to relax. When Simon—in Lars's body—got to the walk, then all that remained would be to fly to Dr. Stroud and have this enormity righted. And, perhaps, Stroud could do something for Simon. After all, Simon could have disposed of Lars's brain, as Halon did with the forester's. Lars tensed.

He watched as his body stood wavering in the door of the copter, drop to the ground to sprawl, then stand unsteadily. Unnoticed, in the bushes, a slim pencil of metal pointed, focused. Relays clicked; there was a minute trace of Kester radiation from the entity by the copter. But a stronger and almost total Kester radiation came from the house. There, the computer concluded that even though the copter had given the correct landing signals, the being that emerged was not Kester. The lazer drew on inexhaustible atomics; the beam enveloped Simon-Lars, outlining the body for a moment in brilliance, then winked out. There was not even a vapor left in the air where a moment before had been a living man. At the door, Cain reached up, pressed a nerve center at the back of the neck, and caught Lars as he crumpled.

"Borland, bring a sedative." Cain injected it carefully into the arm of the unconscious man, injecting slowly, feeling for pulse and watching respiration. Finally, satisfied, he laid the old body gently on the couch in the living room.

"Why'd you do that?" Borland was curious.

"Lars has been through enough. He was hoping to get his own body back; then it was utterly, completely, destroyed. Before his mind could react to the shock, I made him unconscious."

"But when he wakes up? Won't he have to face it sometime?"

"Not if he can live through a couple of hours of sedation. The brain, even a few cells of the brain, alive, are the man. Not the body. The brain contains Lars. And Stroud can build a new body from the brain. In the rebuilding, the memory will be there of this occurrence, but it can be lessened in importance." Cain looked at Borland.

"You're the technician. Why don't you re-set these traps to admit just the two of us? You and I? This might make us a good retreat, some day."

Borland nodded, left. Cain watched the rhythmic rise and fall of Lars's chest. Lars would be all right. Nothing, now, to stop him from finding Levitt. Of course, he would have to deal with the Guild—but Levitt was the end-aim.

It promised good hunting.

"All done." Borland was back. Cain picked up the unconscious form and they went together into the bright mountain sunshine. ■

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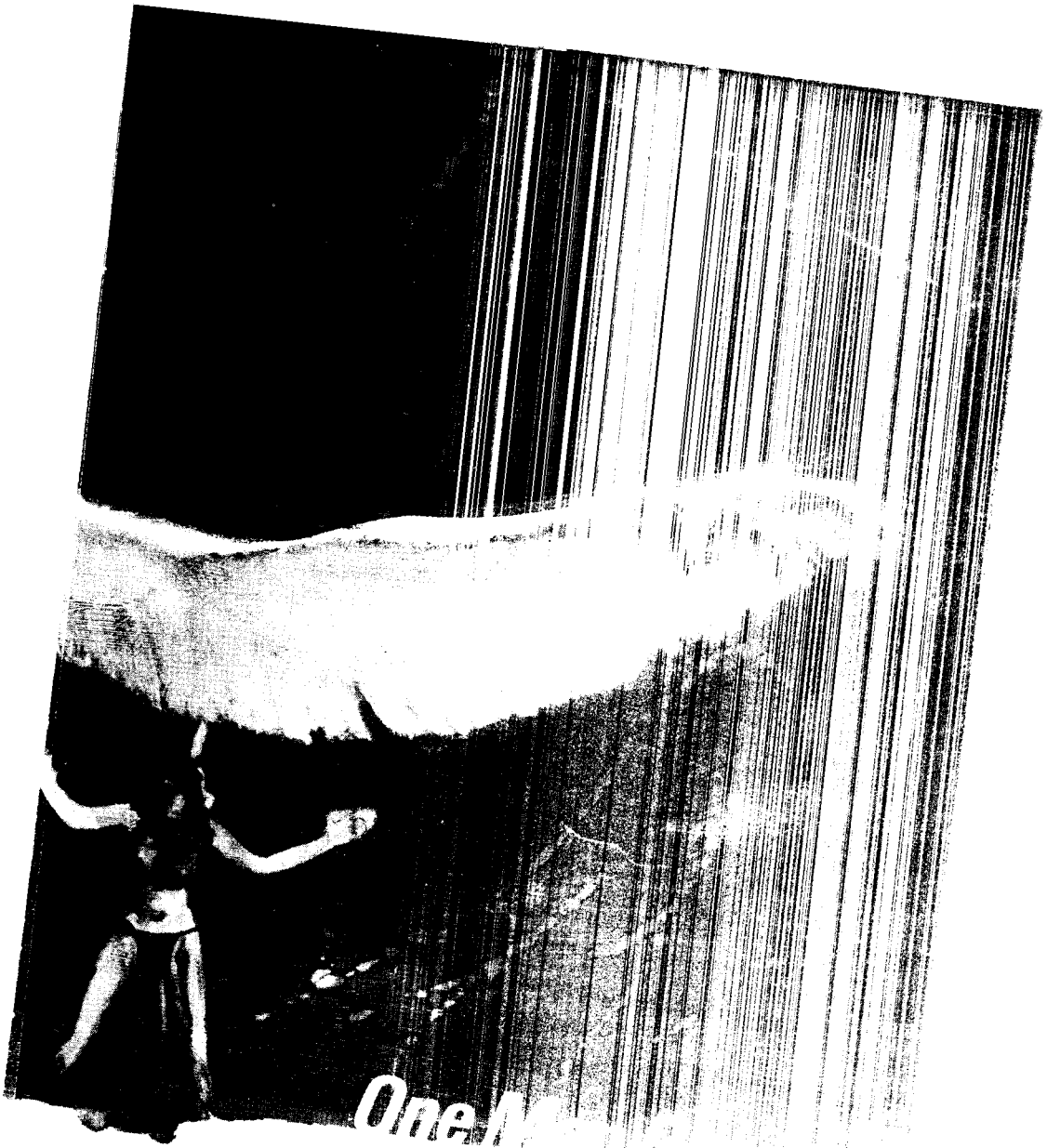

One M

It's not always easy to tell the dogs from the fauna without a program

BY JOSEPH GRE

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"It looks so good it scares me," said First Officer Pasquale Morelli, turning away from the viewscreen to speak to Lars Holmquist. He had just reported to the bridge and received his first look at the planet below. "I'd like to send down a probe ahead of the shuttle."

The captain of the United Mankind Ship *Explorer* chuckled. Lars was a Dane, a big and bearded blond throwback to Viking ancestors, the image spoiled somewhat by a developing middle-aged paunch. He glanced at his console chronometer, rose to his feet, and in his somewhat formal World English said, "You are in command as of now, Pat; you may do as you think best. I ask one favor. When you conclude that it is indeed safe, please schedule Margarete and I for the first week of R&R."

"Well, at least you *asked,*" said Pat, grinning up at his much taller superior. In contrast, he was short, lean, and darkly olive. "Take Deerheart down with you, too. She got bored and overworked herself on those analyses from Jungleland."

"I see no reason why Deerheart and all the other scientists should not go downside for the full two weeks. Crewmen, of course, will take one week each." Lars sounded slightly resentful, and Pat repressed a smile. As a member of the flight crew, married to a scientist, he knew the appearance of privilege was illusory, that under normal circumstances the scientific contingent worked harder and longer than the spacemen. Lars's wife, Margarete, had a foot in both camps.

The captain left for a short nap, and Pat spoke to the engineering duty officer on the intercom. The probes were specialized into biological, geological, atmospheric, and general underwater versions. He ordered a biological launched. Within five minutes the engineer had one calibrated to the planet, programmed, and on its way. Heavily protected, it shed orbital speed by atmospheric friction. In less than fifteen minutes the probe was flying above the treetops, scanning the terrain and relaying the picture and other data to the *Explorer.* The operator hunted a place to land before its meager fuel supply was exhausted. When a clearing appeared he promptly set it down, and activated the soil analyzer and microscope. The bacteria detector had been sampling the air through the latter part of the flight.

The *Explorer*'s low orbit took it out of range just four minutes after the landing, and the probe automatically went to the storage mode. Pat enjoyed the lovely scenery for an hour, and called for a data dump into the computer as soon as the probe's carrier wave was picked up on the second orbit. The ship's giant banks did the secondary analyses, the synthesis, and the integration. By the time they were passing over the probe Pat had to concede that the world below was better suited for human occupancy than Earth itself.

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This unnamed planet circled a G4 star slightly smaller than Sol. There were only two major planets, exactly opposite each other in very stable 80-million mile orbits. They had entered the system at a point that put the other world 160-million miles away, and barely scanned it before it was lost behind the sun. This star was a heavy rf emitter and interference had ruined all data except the visual, but they had determined its size and orbit; a twin to the one below. The astronomer was analyzing the input to see if the opposite world had moons. This one had four medium-sized satellites, in orbits that ensured at least one always being above the horizon. The average albedo was 0.14, double that of Luna; this world had beautiful moonlit nights. It also had a dense animal population to enjoy them. There were more life forms than the ship's biological section could properly classify in a lifetime, many of them large and potentially dangerous. The microscopic life, far more to be feared, was benign to the limit of the ship's computer to extrapolate. There was always the risk of an entirely new or undetected disease, but all spacefarers had the added protection of a "tame" virus in the bloodstream that viciously attacked intruding organisms.

The scene from the probe's slowly turning camera was being relayed to the flight-deck's main screen. The little clearing it had landed in was on the shore of a small lake, in a sandy area where the bottom seemed almost free of plant growths and there was a lovely small beach. Tall hardwood trees grew thickly on every side. The grass appeared thick and rich, and there was little brush. As Pat watched, one of the larger animals the camera had already spotted approached the probe, staring curiously at the camera. The operator stopped its rotation and the creature walked directly toward the lens, completely unafraid. It was a biped about five feet in height, a lean, hard figure of compact muscles and bird-like tendons, covered from head to knee joint with a thin blanket of soft down. Huge brown eyes stared into the camera lens, growing enormous on the large screen. The face was dominated by a short, broad beak, and the head was large and round. Instead of true wings it had articulated upper limbs ending in horny talons. The creature's erect posture and four limbs made it seem almost humanoid, but it walked with a rhythmic, jerky movement that betrayed ornithoid origins.

Pat had only a moment to study the curious biped. The probe relayed a whistling, screeching sound from out of camera sight, and the animal suddenly turned and ran back the way it had come. In full flight it moved with incredible swiftness, the slim lower legs and three-toed feet only a blur to the eye; in seconds it vanished among the trees. The camera caught a brief glimpse of two

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pursuing figures; they appeared to be members of the same species.

When they lost the probe again Pat ordered the shuttle prepared for flight. The cheerfully feminine voice of Lhasa Chungita, the shuttle specialist, informed him it had been ready for two hours.

"I'm about to post the duty roster for the first week, and the name of Ras Chungita is prominently on top," Pat told her. "You have to stay down with the shuttle, of course." Both Ras and Lhasa were members of the crew, the only two among the eight not married to a member of the *Explorer*'s twenty scientists.

"You're a liar, and a dirty old man besides," Lhasa's happily insubordinate voice crackled over the intercom. "Announce the three unlucky souls who are staying with you and let the rest of us go."

Pat chuckled, and broke the connection. Lhasa knew him too well to have taken the threat of separate Rest & Recreation for the Chungitas seriously. He buzzed the Holmquist cabin, and knew the captain was asleep when it was quickly answered by Margarete. She was a physiological researcher who doubled as ship's M.D. The Holmquists were packed and awaiting his signal.

On the next approach to the probe the shuttle dropped away, leaving only Pat and three crewmen—the least of whom had a master's degree in an engineering discipline—manning the *Explorer.*

Pat knew the entire ship's company badly needed the R&R. They had left the KO component of 40 Eridani four months back, and this system was the last one they would pass near on the way home. While making the relatively short trips between the stars in their assigned survey area they had abandoned the regular travel routine. Instead of four hours of 2.5G in the Accel or Decel Mode, followed by six hours of 0.4G in Rotation Mode, they had operated for months on a basis of four hours each. Every person on board was both physically tired and mentally bored. Even 2.5Gs was hard on the human body when the stress endured for several hours, and confinement to the accel couches grew very monotonous. This system was on their second priority schedule, and Lars had decided they would not work while here. On leaving they would have accel periods for four months, coast one, and decel for another four to Earth. Two weeks of freedom under 1G seemed a good investment in morale. Pat, Lars, and the six crewmen would have only one week each, but that was far better than nothing.

And the first four unlucky ones settled down to a monotonous week of routine maintenance, performing some chores that were best handled in zero-G.

On the morning of the fifth day Deerheart Morelli made a personal call to Pat when the U.M.S. *Explorer*

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orbited into radio range. After an exchange of endearing words she said, "I really called to tell you a snake has slithered into our little garden. The behavior of these large landbirds has Lars and Anse Hardy worried. The things seem completely unafraid of us, and there are thousands of them around. If they should decide to attack . . . We already keep a nightwatch against the larger carnivores, but my chief has Lars worried enough that he's told us to capture one and see what we can learn. We're going to rig some traps today."

"You mean you had to go to *work?* You poor overstressed kid," said Pat, who had just finished helping two shipmates pull a very bulky deuterium pump and replace a leaking seal. "Any other problems?"

"Don't be a null. No real problems here, except"—she made a kissing sound—"that I miss you."

"You will stop missing me and enjoy yourself. And that's an order!" Pat growled in his best First Officer manner. Actually only Lars held authority over the scientists. Deerheart's real boss was Anscombe Hardy, the chief biologist.

She sent him another kiss and broke the connection. Pat went back to work, somewhat puzzled. Anse Hardy was a known fussbudget and worrier, but it was not like Lars to order someone to work when they were supposed to be relaxing.

On the seventh day Deerheart called again. They had made their traps but failed to catch a single Fastie, as they had dubbed the overlarge landbirds. Anse Hardy was getting upset because the two assistant biologists did not have their hearts in the assigned work. Everyone else was hugely enjoying the R&R, and the four, who could only stay a week, were lamenting their hard luck.

On the second orbit on the eighth day the shuttle gently fitted itself into its cut-out in the central hull, and Lars resumed command. Pat said hello to the Chungitas and the fourth crewman, who had had to leave her scientist husband below, and gave Lars a detailed status report. Although he was in a hurry to join Deerheart, Pat asked Lars why they were worried about the large landbirds.

The tall captain hesitated, then said slowly, "It is the oddness of their behavior that worries Anse and me, Pat. They are . . . disturbing. Sometimes they simply run around like any animal, eating or loafing, but at others . . . they gather into massed teams, almost like armies, and play complicated games. We had not realized they could organize and coordinate their actions that well. If they should decide to attack as a body, the landing party could be wiped out. Anse convinced me it was best to capture and examine one, but so far they have not succeeded."

Inability to capture a large landbird when there were thousands around did seem odd. Pat decided it

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was not his problem, and concentrated on getting himself and his three companions down to the surface. He was an alternate shuttle operator, and the only one available. The versatile craft had to land vertically, there being no open area nearby for a horizontal runway. It taxed Pat's skill to set its four legs down in the small space available. When he finally killed the rockets and felt the shuttle settle solidly upright, he had to wipe sweat off his forehead. Pat hurried down the access ladder in Leg Three, to find a nearly nude Deerheart waiting amidst fitfully burning grass at its base. Her long and very black hair hung free to her shoulders, and a large white feather stood casually upright from a band around her forehead.

After a long and joyful kiss, the first thing Deerheart told Pat was that they still had not captured a Fastie. Anscombe Hardy had decided a dissection would do as well as a live examination, and wanted to shoot one. She had stubbornly resisted the idea, insisting the traps would eventually work. Her reasons were part reluctance to kill an alien creature obviously not far from intelligence, and part worry about the consequences. If killing one made the others hostile, the humans' vacation might be cut short.

Pat held his short, strongly built wife in his arms—Deerheart weighed slightly more than he did—and examined the camp. The area that had been held clear for the shuttle took up most of the open space, except for the gently sloping beach. The small lake was far prettier than it had appeared on the viewscreen; the expended probe rested on the grass a short distance from the water. The tall hardwood trees were majestic and stately. They seemed to have crowded out most of the usual brush, giving an almost cathedrallike air of spaciousness under their branches. The temperature was pleasant, and the breeze carried an odor first cousin to pine. Lean-tos, plastic tents, and various other shelters were scattered around the general vicinity. It would have been a restful woodland scene at any time. To people facing eight months of grinding accel-decel periods to Earth, it was the next thing to paradise.

The other three crewmen were enthusiastically greeting their wives and husbands. Most of the people in the camp, like Deerheart, wore a bare minimum of clothing. Pat saw that her coppery skin had reddened slightly from the sun, and despite the fact she was supposed to be working she looked happy and carefree.

A two-legged creature almost as tall as Deerheart broke from the nearby trees and streaked toward them, moving with almost incredible speed. Two more appeared, apparently converging to head it off. Deerheart also saw the runners, noted his alarm, and turned in his arms to say, "Nothing to be afraid of; watch."

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It was close, but the Fastie in the lead reached them just inches ahead of the grasping talons of the two pursuers. It stopped near Deerheart, not touching her but standing close. The other two swerved away and continued across the clearing, disappearing on the opposite side.

"Pat, try to grab it," Deerheart said softly. She made no move herself.

He had already partially turned to face the creature. This close it seemed more humanoid than he had realized, primarily because it stood upright; in motion it leaned forward, far more like a bird. It was breathing rapidly but evenly, and seemed completely unafraid of the larger humans.

That heavy beak looked dangerous, but Pat decided he could probably hold it until help came. He jumped.

Pat might as well have tried grasping the gentle breeze blowing in off the lake. As he made his first motion, lifting his arms and leaning forward, the Fastie darted sideways. It stopped, watching with the huge brown eyes as Pat aborted the move and caught his balance, and then streaked back the way it had come. The animal went from stillness to dazzling speed in a second. It vanished in the woods.

Feeling somewhat foolish, Pat turned back to his wife. Deerheart was smiling slightly. She said, "Don't feel outdone; no one has come close to catching one."

"It's the fastest thing on two feet I've ever seen," Pat conceded ruefully. "And I'm no animal psychologist, but that bit of running to us to be sheltered from its pursuers seems very strange. You'd think it would be more afraid of us than members of its own species."

Deerheart linked her arm with Pat's, drawing him toward a lean-to near the shore. "You just *think* that one's fast. I've dropped a hand-released rope net on one, watched it touch his shoulders . . . and he *vanished!* Actually moved so fast he blurred before my eyes, and then was gone."

"Can't you shoot one with a paralysis hypo?" asked Pat.

"No, beloved idiot." She gestured for him to be seated on a mattress of springy boughs covered by a blanket, under the shade of the slanted roof. "I haven't the faintest notion of how our drugs would affect one. Any given dose could be fatal, or completely ineffective. Now I'll be happy to supply the right potion *after* you catch one and give me a blood sample."

"Thanks a lot. What does your boss plan to do?"

Deerheart shrugged. "Anse is going to shoot one tomorrow if no luck with the traps, and I'm a little . . . afraid. They're just too darn near human. I think they'd rate above the dog, or porpoise, in intelligence, but we've never encountered a semi-intelligent ornithoid before and have no established behavior patterns for

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comparison. I trust you noticed the wing tips have evolved into talons with an excellent grasping ability?"

"Yes, but there's something you haven't grasped," said Pat, stretching out comfortably and relaxing. "*I'm* on vacation. Let me know when you catch one."

But Deerheart dug him unmercifully in the ribs, and when he rolled away, yelping in pain, she laughed at him and ran into the water. He eventually caught and thoroughly dunked her, but knew there was no getting out of helping his wife.

Next morning Pat, who had had some experience in capturing animals for zoos as a college student, studied the four traps Anscombe and Deerheart had improvised. All were of the net type, and he could see nothing wrong with them. Three were activated by trip-ropes and the fourth by a hand-pulled release. While they are examining the third one two Fasties appeared, moving slowly for once, and walked directly toward the horizontal trigger cord. Both stepped over the hidden line with a casualness that seemed to border on contempt.

Anscombe Hardy joined them while they were checking the hand-released net. He was carrying a laser rifle. The chief biologist was the oldest person on board the *Explorer,* though only forty-seven. Pat had little liking for him, primarily because the scientist seemed to have developed mental hardening of the arteries. The U.M.S. *Explorer* had investigated fourteen star systems in its assigned area. Eleven possessed planets, and life existed on a total of sixteen, life in such bountiful profusion and strange forms that the three biologists could not have hoped to do more than scan it in a lifetime. Three of the worlds were inhabited by primitive humanoids with rudimentary civilizations. Nowhere, however, was there any sign of another species even approaching the machine technology stage. And the *Explorer*'s chief biologist had decided *Homo sapiens* as unique in the galaxy, and, therefore, superior.

It was an old and familiar attitude, one that colored a person's thinking in innumerable subtle ways. In Pat's opinion it was also premature. The *Search* and the *Quest* had departed Earth with the *Explorer,* and since only a self-propelled solid object could exceed the Einsteinian limitation, their radio reports would arrive at Earth some forty or fifty years after the ships completed their three-year voyages. The data was dispatched only as a safety factor, in case the ship itself did not return. But it was quite possible they would arrive home with their own reports and learn one or both the other ships had contacted civilizations equal to Man's. Anscombe Hardy had dismissed the possibility from his mind.

There were no Fasties in sight at the moment. They seemed to come and go in odd patterns, sometimes acting as loose groups, at others as

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individuals. Only twice had they been observed to mass into what resembled armies, and the encounters between the three opposing forces had taken place well away from the camp. Ras Chungita had observed and reported on one. All Fasties in the area had apparently been there, and the three groups had met and mingled in complicated move and countermove, advance and retreat, the motions occurring at top speed. The human eye had been unable to follow individual actions, but Ras had seen a large number drop out and later leave the area. Not one Fastie had been hurt or killed, though many collapsed and lay on the grass a time before leaving.

It sounded like a mating ritual to Pat, the equivalent of the "King of the Hill" selection process used by several species of deer on Earth. Deerheart, with her vastly superior knowledge of animal behavior, assured him there were more differences than similarities between the reported actions and those of her namesakes.

"Are you absolutely determined to shoot one, Anse?" asked Deerheart. She sounded more annoyed than respectful of her official chief's authority.

"Yes, yes indeed I am," Anscombe replied testily, clutching the gun as though it were a strange new toy. In fact, Pat knew the biologist was a very good shot. The older man was short and sturdy as a keg, with a balding pate and very wide shoulders. He had made a lucky discovery as a graduate student, and ridden his fame into a sinecure as department head of biological sciences at the University of Mankind.

"I really don't understand your reluctance, Deer," Anscombe went on, his voice fretful. "You are certainly not displaying a very professional attitude."

Deerheart shrugged. "The ancestral voices of my people are warning me, Anse. There's an old Indian saying that goes, 'Better to fight the big wolf than the little wolverine, for the wolf is what he appears but the small stinking one is death in disguise.' "

Anse Hardy looked baffled, and Pat had to hide a smile. Deerheart made up her old Indian sayings to suit the occasion.

There was a sudden jarring, savage scream to Pat's left. He whirled in time to see a flying body land on the shoulders of a Fastie who had appeared beneath a tree a hundred feet away. The low branch on which the cat had hidden was still swinging from the recoil.

The hunter's paralyzing cry had done its work. For a second sheer fright had immobilized the victim, and the Fastie went down beneath the hurtling weight. Pat, though his biology was limited, realized they were watching a night-prowler who had missed his kill and continued the hunt into the day. The humans kept their camp well-lighted and a guard posted, just in case the strangeness of

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their smell was not enough to discourage carnivores such as this one. No one knew where the Fasties went when darkness fell, but in the daytime their astonishing speed kept them safe from meat-eaters. This one had been caught quite unprepared.

The big cat had his claws locked in the down-covered shoulders. Pat saw the gleaming fangs in the open mouth as the hunter struck at the neck, saw the frantically writhing ornithoid thrust a protecting arm between his throat and the seeking jaws—and the long teeth closed on empty air. The Fastie had vanished.

The cat lost its balance, fell on one shoulder, and sprang erect, howling in comic outrage. The passion of the kill had vanished as abruptly as the victim. As Pat watched, not quite believing his eyes, the carnivore trotted in a short circle around the ambush site, visibly sniffing for a trail. Baffled, it sat on its haunches and looked up into the trees. After a moment it whined like a discouraged dog and trotted away, tail dragging.

"Would one of you two explain that to me?" asked Pat. Deerheart and Anscombe were staring at each other, faces equally bewildered.

"I wish I could!" Deerheart said fervently. "Now we have an unknown factor; how did it wiggle out of the claws and *then* use its speed to vanish? Still going to shoot one, Anse?"

"Why yes, certainly!" the chief biologist looked baffled but determined. "It must have a very loose skin, as many bird species do, and endured some injuries to rip itself free of the claws. Possibly it moved behind that brush to the right on all fours and with the same speed it exhibits while erect, so that to us it seemed to literally vanish. You look skeptical; do you have a better explanation?"

"No, but I'd rather be without one than accept a rationalization like that!" Deerheart said, her voice rising. "I don't want to be there when you shoot one, Anse. I'm afraid of what may happen to you."

"Then you had better be leaving," Anscombe said coldly, raising the rifle butt to his shoulder. "There's one now."

Another Fastie, apparently identical to the first, had appeared and was walking toward the spot where the attack had occurred. For a Fastie he was moving quite slowly. As Anscombe sighted on him Pat acted on an impulse he could not explain, and abruptly thrust a hand against the gun's stock. The ornithoid looked up and saw the humans, just as a beam of bluish light burned past his face and obliterated a patch of leaves behind him. The Fastie vanished.

"What did you do that for!" demanded Anscombe angrily, lowering the gun and turning on Pat. "I'll file interference charges against you, Mister!"

"I think I can justify assuming Lars's authority when he isn't here," Pat said calmly. "File any charges

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you please. For now, I'm taking the gun." And he suited action to word by pulling it out of the other man's grasp. "You will confine yourself to nonharmful means of examining the landbirds, Mr. Hardy. And that's an order!"

"You . . . you have no right!" Anscombe spluttered indignantly. "You are *not* my superior! I—" And then a Fastie appeared by Pat's elbow and yanked the laser out of his hands. The creature vanished as abruptly as it had come, taking the gun. Behind them there were surprised yells from the camp. Alarmed, Pat hurried back to the main group, Deerheart and Anscombe at his heels.

It took only a moment for Pat to sort the tangled reports and realize what had happened. A Fastie had suddenly appeared near every human who possessed a weapon, including knives and other cutting instruments. Every item had been suddenly and forcefully plucked out of its owner's grasp, and the thief had vanished into thin air.

Pat looked around at the beautiful scene. The golden sunlight was playing across the surface of the little lake, and quartz grains sparkled on the sandy beach. The woods were cool and green and lovely, and a gentle breeze fluttered leaves that lived and breathed.

Pat did some rapid mental calculations. There would be just time to prepare for liftoff before the *Explorer* rose above the horizon on its third orbit of the day. He turned to the scientists and crewmen and said, "Pack up! We're lifting off in thirty-five minutes. All leaves are canceled and all personnel will be in the shuttle by 10:45."

There were surprised and angry protests, especially from the three crewmen Pat had brought down with him, but little real resistance. A lurking air of danger had enveloped the ship's company, lying like a fearful haze over the sylvan glade and tranquil water. All were ready before the last minute, most of the temporary possessions they had acquired being left in the camp. Deerheart at first had seemed as puzzled as the rest, but she gave Pat a large wink when they were strapped in the accel couches. He had a strong hunch she understood the situation.

Anscombe Hardy did not. In a muttered undertone he had informed Pat he was going to file a protest with Lars Holmquist.

The timing required that Pat lift off before the *Explorer* came into radio range, which saved him one possible argument. By the time he contacted Lars he was almost out of the atmosphere, and rapidly gaining orbital speed. The shuttle had an excellent communications system, and Pat set the multipurpose antenna to its widest scanning range and began recording. He also used the computer to select an intersecting orbit that required they pass between the

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nearest moon and the continent they were leaving. Twenty minutes after lift-off he was using the attitude jets to ease the shuttle into its locks. Five minutes after that he, Deerheart, and Anscombe Hardy were facing Lars on the bridge.

"What happened, Pat?" asked Lars quietly. "Why did you perform an emergency liftoff?"

"There's also the matter of the charges I am filing for his interference with a scientist!" Anscombe broke in before Pat could answer. "The work being performed was at your specific order, Lars. He's guilty of insubordination as well!"

"Please be quiet, Anse," Lars said, without raising his voice. "Pat?"

Instead of answering Pat extended his hand. When Lars took the proffered container he said, "That's a tape of a very tight beam Extra-High Frequency transmission I recorded on the way up, Lars. It will show a simple triggering signal from the surface, and a response from the closest moon that contains waveforms I think you'll find too complex for analysis. But I can tell you what the second one is; the operating beam of a matter transmitter."

Lars's normally grave expression became more so. Matter transmitters were only a theoretical principle on Earth. "Are you saying the Fasties operate such a transmitter from that moon, Pat?"

"I'd say probably every moon, so that there's always one available," Pat answered. "When we head for home I suggest we focus our main antenna on the twin of this planet. I predict we'll find the entire rf spectrum full of signals."

"Which were masked by the sun because of the angle of our approach!" Deerheart chimed in.

"Are you saying these . . . these overgrown birds are intelligent beings?" Anscombe demanded incredulously. "Surely you can't be serious! Why they haven't even developed enough to wear clothes! There were no tools, no artifacts, no . . . you're insane!"

"Oh, I think there were artifacts, Anse; we just couldn't see them. I think every Fastie on the surface has a little transmitter implanted under his skin somewhere, probably with a direct contact to the brain. I think they were always in touch with a tight-beam relay on the surface, one that amplified their very weak personal signals and sent them on to the matter transmitter. When that terrific physical speed couldn't get one out of danger he transported himself back to the Moon.

"Hasn't it dawned on you what that planet below is, Anse?" Pat went on. "Don't you understand why the Fasties go nude and have no weapons? The whole darn world is a vacation resort! It's a play planet for a species that's got a little further up the ladder than we have, a place where they can go back to nature and relax and enjoy the primitive life. I'll also predict that the twin world is crowded, everyone's favorite

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relaxation is some form of physical sport—and their games are played primarily over here!"

"Then I do not understand why they allowed us to orbit and land, interfere with their games," said Lars. "If they are that advanced why did they not communicate with us, send us on our way if they were not interested in making friends?"

"Your guess is as good as mine here, but I'll make one," said Pat. "I think it's not a part of their cultural norm to attempt contact with strangers. When we arrived and landed on their vacation resort they accepted us as a new factor in their games, just as they've worked on the carnivores and other animals. Their reluctance to transmit out of a game—they used the ability only when a life was threatened—makes me think there's a point penalty involved, some detriment to winning the particular game they're playing. When they decided we were actually dangerous they transmitted freely enough, and relieved us of our weapons."

"That was after Anse was idiot enough to try to shoot one," Deerheart said tartly. The chief biologist gave her an angry scowl.

"I'll make a final recommendation," Pat went on, relaxing when he saw no disbelief on Lars's bearded features. "Let's get the heck out of here and let the next survey ship try to contact the home planet. We've made fools of ourselves by not recognizing them, we tried to shoot one, and we interfered with their recreation and maybe cost some favorite team points. We've done enough damage for one crew. I don't feel safe here, and if they'll let us leave without inferference I think we should be on our way."

Lars turned and ordered the helmsman to prepare to leave orbit. Anscombe hurried away, throwing Deerheart an unforgiving scowl over his shoulder. Pat smiled at his wife, and moved to the communications console himself. He wanted to set it for as complete a recording of rf data from the twin planet as its capacity permitted. And he would dispatch it immediately on to Earth; the news that a high civilization had been found would arrive whether they did or not.

But he had a feeling they would make it safely home, and he and Deerheart would again enjoy a brisk game of tennis on a very civilized plastifoot court. Every culture to its own. ■

The Analytical Laboratory/November 1971

PLACE	TITLE	AUTHOR	POINTS
1.	...And Silently Vanish Away...	*Glen Bever*	2.53
2.	...The Old Man of Ondine...	*Terrence MacKann*	2.56
3.	...Hierarchies (*Conclusion*) ...	*John T. Phillifent*	2.68
4.	...Holding Action...	*Andrew M. Stephenson*	3.18
5.	...Compulsion Worse Confounded ...	*Robert Chilson*	4.43
6.	...The Nothing Venireman One...	*W. Macfarlane*	4.56

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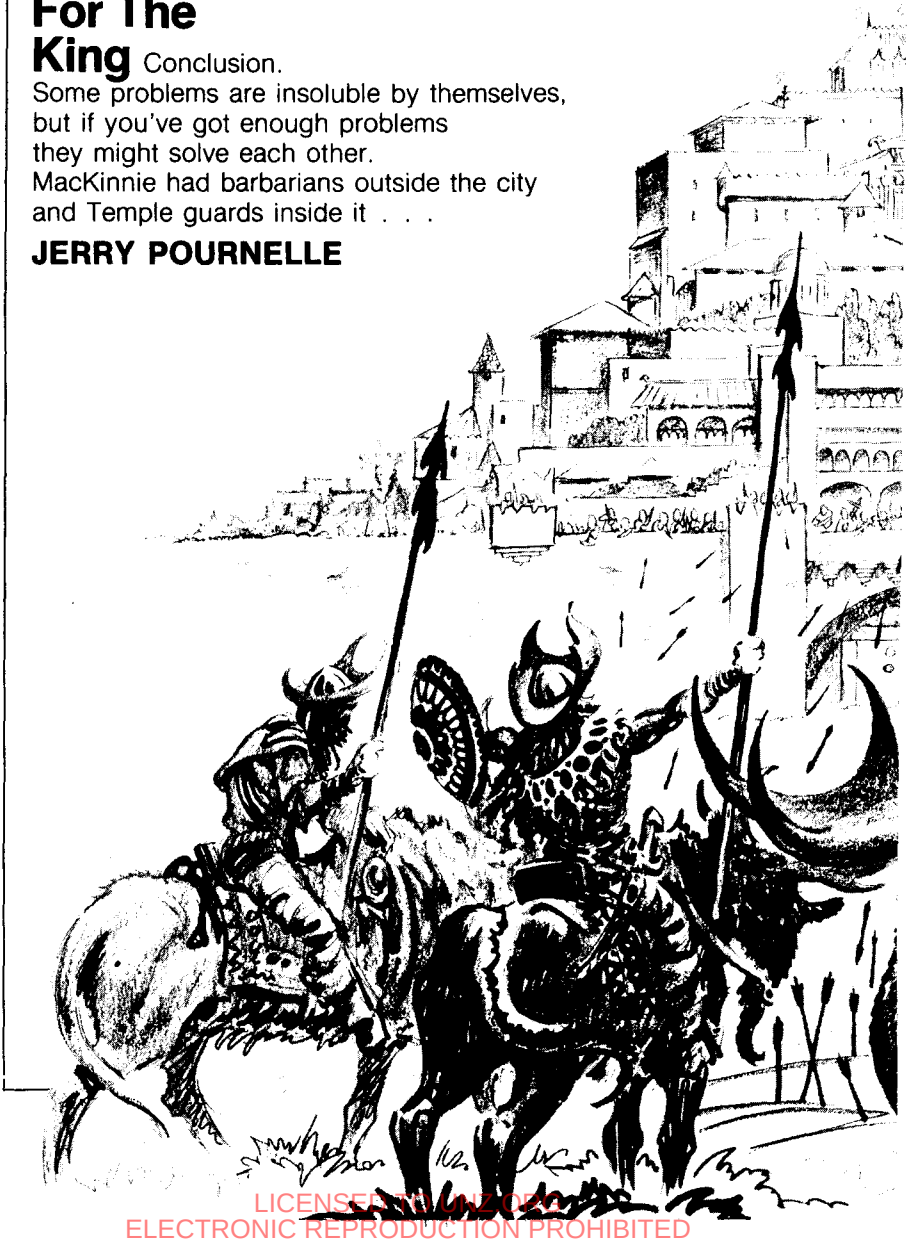
A Spaceship For The King

Conclusion.

Some problems are insoluble by themselves, but if you've got enough problems they might solve each other. MacKinnie had barbarians outside the city and Temple guards inside it . . .

JERRY POURNELLE



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Synopsis

Prince Samual's World was devastated by the Secession War which broke up humanity's First Empire. It has slowly developed technology roughly equivalent to the early Nineteenth Century but retains traditions of lost scientific achievements. Redevelopment has been slow, with constant warfare among independent city-states and kingdoms.

COLONEL NATHAN MACKINNIE, called Iron MacKinnie by his soldiers, has been cashiered from his post as acknowledged best soldier of the Republic of Orleans. Iron MacKinnie and his Wolves repeatedly defeated the forces of the Republic's powerful neighbor, the Kingdom of Haven, until Prince Samual's World was rediscovered by the renascent SECOND Empire and the Imperial Navy allied with King David of Haven. Using navy space weapons, King David is moving to establish rule over the entire planet.

MacKinnie and his former sergeant, HAL STARK, overhear a drunken young Imperial Navy officer telling about a primitive planet called MAKASSAR where "they wear iron pants and fight with swords," have no machinery except a First Empire Library which they use as a Temple, not suspecting what the building really is. The officer is also overheard by King David's secret police, whose chief, MALCOLM DOUGAL decides to make use of both the information and MacKinnie. Dougal has found that the Empire has several classes of membership based on technological status at the time of incorporation. Only planets having space travel have any real rights; the others become colonies subject to the absolute rule of the Imperial government on Sparta.

The Imperial Navy is fanatically determined to bring all of humanity under Imperial rule to prevent wars like the Secession War, and its policy is to unite mankind without much regard for abstractions like freedom and independence. Because the Navy is spread too thin to immediately incorporate newly discovered planets like Samual and Makassar, the Empire allows no technology imports. Thus, although Haven as an Imperial ally has theoretical rights to interstellar travel and trade, the Haven traders may not visit planets with more advanced technology or buy from them.

However, Makassar is classed as a primitive world and is on the approved list for trade with Samual. Dougal believes the Imperial bureaucracy has forgotten the Library since the natives cannot use it and it is guarded by a priesthood who believe that God will someday speak from the Temple. Haven needs a military officer, and since the Imperial Navy would know King David's best soldiers, MacKinnie is recruited to head an expedition to Makassar, ostensibly to trade, but actually to bring back knowledge of space technology from the Temple Library. Haven will use this to construct a spaceship so that

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King David can bring Prince Samual's World into the Empire in one of the higher classifications, thus escaping colonization.

MacKinnie agrees and swears allegiance to Haven. He and Stark recruit several former Wolves as Trader's guards, and Haven supplies other personnel including: JAMIE McLEAN, Haven naval officer posing as a merchant captain; Academician HAROLD LONGWAY, a social scientist with experience among primitives on Samual; Scholar HOMER KLEINST, a brilliant nineteen year old physics student who poses as Longway's social studies assistant; and Freelady MARY GRAHAM, daughter of an officer of Haven Secret Police, who will be expedition secretary. There are also additional guards, including TODD, a Haven officer cadet.

The expedition is taken to Makassar by Imperial Traders Association ship, and stranded there for at least a local year when the merchant they are dealing with thinks he has tricked MacKinnie. The Imperial Navy garrison on Makassar consists of only a handful of men and no ships, and is located on the western edge of the planet's single continent. The city of BATAV, where the Library is located, is thousands of kilometers away across plains overrun with barbarians, while the seas are unsafe because of pirates. The Navy can offer neither transportation nor protection, but will prosecute MacKinnie for any infraction of the technology regulations. The lieutenant in charge on the planet also asks MacKinnie to find out what happened to a group of missionaries who have vanished and are probably dead.

MacKinnie buys the only seaworthy ship in the garrison town, and McLean improves its sailing capabilities with leeboards and more efficient sails, neither of which the Imperials recognize as technological improvements because they seem so primitive by space-faring standards. With the aid of BRETT, an itinerant singer, and VANJYNK, a dispossessed nobleman, the expedition outruns and outfights the pirates and manages to sail to BATAV.

They find the city under siege by fierce barbarian plainsmen called maris. Kleinst deduces that the extreme axial tilt and elliptic orbit of Makassar is causing climatic deviations, bringing the barbarians north to the equator where they attack cities. The Temple priests retain tight control of the city, but have lost their influence across the continent, and are hard pressed to defend the city itself. Most of the people of Batav have lost heart and are waiting to be overrun; Brett tells MacKinnie and Mary Graham that if the city falls, the barbarians will slaughter all the inhabitants and burn the city to the ground.

The Library is guarded by the fanatical Temple priesthood who permit no one to examine the "holy relics," and MacKinnie is not sure he could make use of the Library even if he had free access; he has reason to suspect

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that the information is stored in something other than books, but he does not know what.

MacKinnie and his troops are aboard their ship in the harbor of Batav when they are approached by an armed party. The leader calls to him, and MacKinnie realizes he is speaking the Imperial language.

Part 3

"Are there any here who understand me?" He switched quickly to a local dialect. "Peace and greetings."

"Welcome aboard," MacKinnie answered in what he hoped was the Imperial speech. "And what may I do for Your Honor?"

The man turned to his companion and said something quickly, then looked back at MacKinnie in obvious relief. "Thank the Savior, the Navy has come to find us. Our prayers have been answered. When we heard there was a ship from Jikar, we hardly dared hope."

MacKinnie stared at the small party. The two leaders were both tall and dark, looking nothing like the locals MacKinnie had seen. Their guards, by contrast, were all obvious locals, probably hired swordsmen of doubtful ability.

"Come aboard, please," MacKinnie said. "May we make your guards comfortable with wine and something to eat?"

"Thank you."

MacKinnie nodded to Todd, sending him scurrying below to find Hal and arrange for refreshments for the guards. The two tall starmen were helped aboard and led to the owner's cabin below. When they were seated and wine brought, they introduced themselves.

"I am Father Deluca, and this is His Lordship Auxiliary Bishop Laraine. We are representatives of His Eminence the Archbishop Casteliano, Missionary ruler of the Church on this forsaken planet. It is a miracle that you have found us."

"I do not understand Your Reverence," Nathan said. "Surely you have means to call the Navy whenever you wish?"

"No, my son," Bishop Laraine said sadly. "The barbarians have destroyed our transmitter. Brother LeMoyne could have repaired it had they not been so thorough, but we were fortunate to escape with our lives. Two other members of our mission, a brother and a priest, were not so favored, God rest their souls. We made our way to this city, and here we stay, besieged by barbarians, with little gold, no communicator, and afraid even to allow these heathens to know our true mission. They burn heretics here, and they believe us to be such. Not that martyrdom is so frightening, but it would hardly accomplish anything for the Faith under the circumstances."

"I would not contradict His Reverence," Deluca said, "but in reality these are not heathens. They believe all of the doctrines of the Church,

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except submission to the authority of New Rome. But they also believe they have a divine inspiration, holy relics, enclosed in that Temple of theirs, and that God speaks to them from their Temple. They even have records showing that their bishops have a direct continuity with the first bishops of Makassar. I believe New Rome might rule that they could be accepted in the Church without new baptism, would their hierarchy only submit to authority."

The bishop shook his head sadly. "What Father Deluca says is true enough, but there is no way to dispel them of their illusions. They truly believe these artifacts of theirs contain Holy Writ, which no doubt they do, there being copies of the Bible in the Library I am sure, but they believe their Temple to be a source of continuing and everlasting revelation."

"I see," MacKinnie told them. He drained his glass of wine, thinking of what to tell them. Nathan had no experience at lying to the clergy, his contacts with the priestly orders being limited to one or another of the many varieties of military chaplains who had served with him, and he was vaguely disturbed. He decided on a compromise. "I don't like to tell you this, Your Reverence, but only part of your problems have been solved by our arrival. We have no transmitter either." He used the unfamiliar word cautiously, but no one responded. "We do have gold and we can make your stay here more secure, but it will be sometime before we can get you back to Jikar. The storm season is coming on, and my native shipmaster tells me there is no way to sail westward during that part of the yir. We ran before one westerly gale coming in here, and the seas were dreadful. I am told they get worse."

Laraine showed no emotion at the words, but Father Deluca half rose from his seat, only to strike his head on the low deck beams above him. He sat back down with tears in his eyes, as much from disappointment as the blow. "Then we must stay here in this awful place for another year." He sighed heavily.

"As God wills," Laraine said sharply. "Your offer of money is generous, My Lord. His Eminence will be pleased. Will you come with us to tell him?"

"They tell me I should wait until the Temple people come to inspect my cargo," Nathan answered. "After that, I will be honored to meet His Eminence. What does the local priesthood think you are?"

"Merchants despoiled by the barbarians," Deluca answered. "We thought of fleeing to the nomads and trying to win converts among them, but there are few of us, and the barbarians never listen before they kill. Even the Temple has ceased to send missionaries among them. His Eminence ordered us to remain with him until we were sure there was no chance to win over the Temple hier-

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archy before sacrificing ourselves."

Nathan nodded, filling the wineglasses again. "You have had no success at convincing the Temple people that their holy relics are nothing more than leftovers from the old Empire?" he asked.

MacKinnie studied the priests closely, thinking that if they had not already lost the device with which they could communicate with the Navy, he would have had to arrange to destroy it. The Navy people must not be reminded of the Library at the same time that they thought of Prince Samual's World. It was only because Makassar was so primitive that they hadn't thought of it already.

Deluca shook his head. "We brought Brother LeMoyne, who is both a librarian and trained in physics, hoping to show them, but they will not let us near their sacred relics. No one but the priesthood can touch them, they say. And we, the representatives of the true church, are turned away like Pharasees."

The bishop smiled. "There is a certain, ah, humor, in the situation, My Lord. That we are turned away from the center of this planet's religion. Or what was once the center, because their authority is fast going. I think now it would have been better had we worked in Jikar first, but, of course, we couldn't know that."

Hal knocked at the doorway. "Sir, those deacon people are here to examine the cargo. They say they want to talk to the master of the ship, and also the owner. There're fees to pay for using the harbor, and they want to buy all our food and wine."

Nathan stood, carefully stooping to avoid the deck beams. He had learned that after several painful experiences during the voyage. "If you will excuse me, I will speak to the Temple representatives," he told them. "Please feel free to enjoy any of the facilities or refreshments. Your Excellency," he added, bowing.

"Drive a hard bargain with them," The bishop growled. He waved dismissal.

On deck, MacKinnie found three robed Temple deacons, with two uniformed guards officers, while a rank of ten swordsmen stood at rigid attention on the pier below. The guards uniforms were blue and crimson with silver decorations, the officers' hats plumed, and the Sergeant of Guards carried a gold-headed baton. The discipline of the men, and their weapons, made MacKinnie realize that the Temple commanded a reasonable fighting force. Or, at least, they could obey orders. He wondered why, with their discipline, they had not destroyed the barbarians. Too rigid in their tactics, he thought, remembering Vanjynk and the battle on the Tide Sands.

One of the officers stepped forward from the group around Captain McLean and Crewmaster Loholo. "Are you the owner of this vessel?" he demanded.

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MacKinnie nodded. The officer continued, "I present you to His Excellency, Sindabaya, Junior Archdeacon of the Temple of Truth."

"Peace and greetings," one of the gray-robed men said. "It is customary to bow to me when receiving blessings, Trader. Are you ignorant of the proper forms, or merely a heathen?"

"Your pardon, Excellency," MacKinnie protested. "My thoughts were on the plight of our civilization, and not the more important things at hand." He bowed, receiving another blessing for his trouble.

"It is well. We have not seen you in Batav before, Trader, and when we last saw your shipmaster he had his own ship. Why is this?"

"Pirates, Your Excellency. In all Jikar, there are few merchant ships remaining, and few merchants to buy them, because the army of Jikar takes all the goods for the great expedition. They intend to fight their way through the barbarians before sending the fleet to destroy the nests of pirates."

The officer who had spoken looked up hurriedly, then conversed, in low tones with another robed figure before speaking. "Jikar is not large enough to put forth such an army, or fleet," he said flatly.

"Oh, that is true, sir," MacKinnie said. "But the Guilds have made alliance with other cities, and many of the people of the plains and hills have fled to Jikar for assistance. Then, the fleet captured many pirate vessels by surprise when they dared sail too close into the harbor and were left by the tide. The water ran red for two changes of tide after the battle on the sands, and the Guilds had a large fleet, but few with whom to man it. But when their war on the land is finished, they will turn to training the young men to be sailors, and there is talk of bringing the fleet north, east perhaps, bringing many merchant ships under the protection of fifty galleys of war. But, I . . . I thought, what use to go in such a number? Prices will be low, when there are so many goods for sale. But if now, when there are no ships from Jikar, if now I sail to Batav, and east, and south, why, then trading will be better, and my friends will remember me when the great fleet comes . . . or so I thought. And I was told that the Great Temple, the home of wisdom itself, was in need, and thus I brought my cargo, and of my foodstuffs, I will sell them to the Temple saving only what must remain to feed my men, and I ask no more than what it has cost me to bring the goods."

The gray-robed men muttered among themselves, and their spokesman said, "Your piety is noted. What have you for the Temple?"

It took hours to agree on the price of the cargo, despite MacKinnie's intention to be generous. The deacons were so accustomed to haggling with traders that even when it was not

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necessary they bargained and inspected, poking into the holds and looking in the deck boxes, disputing how much food could be kept for *Subao's* own consumption and what had to be delivered to the Temple. From their concern with foodstuffs, MacKinnie knew the siege was more serious than the Temple would admit. Despite quantities of staple foods in the granaries, there was hunger in Batav, and the Temple priests were taking all precautions, insisting that every ship which called at their port unload all edibles to augment the city's supply. Loss of Temple influence across the land, and the arrogance of the priesthood, meant that few ships came to Batav in this time of need, and they seized all they could find. When the final bargain was struck, a gang of Temple slaves swarmed aboard, carrying away what the Temple had purchased, as the soldiers stood guard over them, searching each for stolen goods and weapons. The deacons watched coldly noting on wooden-backed slates what was taken and what was left aboard.

As the last of the goods were taken ashore, Sindabaya joined MacKinnie and his staff on the quarterdeck. "We guard more than the true faith," the priest said. He waved his hand to indicate the city and harbor. "For all time that we record, the Temple has been the source of wisdom and hope for the people of this world. When other cities fall, we bring the means to build them again. If the Temple falls, what will be the source of knowledge? When God brought men to this place from the stars above, He set the Temple to watch over them and give them truth. That is our burden, and we will not fail."

MacKinnie watched an officer drive one of the slaves into his place in ranks, and said nothing. Sindabaya noted Nathan's expression and continued, "The world has changed. Once they went singing to their tasks. Ships brought wealth to be laid at the steps of God's Temple. Now few ships come, and the barbarians wait outside the walls, and my officers beat the convicts as I watch. But there is no other way! They will not work without blows, and the work must be done! The Temple must be saved!" He turned to the group on the deck and raised his hand in blessing, watched them narrowly for a moment, and left the ship.

Deluca climbed carefully to the quarterdeck as MacKinnie watched the Temple party drive men and ayuks, both overloaded, down the stone streets toward the warehouses.

"Now that they have inspected your ship," Deluca said, "it is lawful for you to leave it. Will you visit the Lord Archbishop?"

MacKinnie nodded, selecting Longway, Kleinst, and Todd to accompany them. Deluca assured them that his own merchant's guard would be sufficient, and would escort them back to the ship after their interview.

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"But you will need our guards," Deluca told them. "The streets are no longer safe. Thieves have banded together in great numbers, and attack even armed men. Our own guards are trustworthy only when together, yet there is nothing to steal and no place to buy food with what gold can be found. The city feels no hope for the future. Only the Temple has the will to fight. The people of the city once ruled much of this world, but now they are ruled by the Temple."

They walked along the broad waterfront street, noting the empty dockyards, warehouses with the doors standing open, and everywhere the beggars and crowds of surly men who had once been the longshoremen of Batav, or owners of small farms outside the walls of the city. Away from the waterfront was little better. They moved through a series of narrow twisting streets overhung with buildings, lined with nearly empty shops. Men lay in rags even in the center of the smaller streets, blocking their way.

They emerged from this maze of alleys to broader streets, each with a stone-lined ditch running down its center. The ditches were partially filled with refuse, but surprisingly little for so primitive a system.

"The men on Temple charity carry away the garbage," Deluca explained, "and bring barrels of water to wash the sewage away in the few dry weeks of the yir. There is heavy rain in this city almost daily, but it never lasts long. This is the cleanest city on Makassar."

MacKinnie remembered Jikar, which was swept daily by the Guild apprentices, but said nothing. Batav was cleaner than he expected a primitive city to be, certainly more so than the garbage strewn warrens of South Continent.

There were people in the streets, looking through the ground-floor shops, although there was little to buy. Every shop had a large crucifix at its door, and a wind chime whose major feature was a replica of the Temple from which various shells and other sounding materials hung. Most of the population were small and dark, although many were taller, fair-haired men like Vanjynk. The tallest were still smaller than MacKinnie and the two clergymen, and here and there someone would turn to watch the group before staring off at nothing again.

Once, MacKinnie saw a group of uniformed Temple guardsmen, with a bright yellow-robed official walking in their midst. He asked Deluca who the man was, and was told "A tax collector. Some of them have taken minor orders beyond the deaconate, but are not full priests. They don't allow the priesthood to work directly on squeezing the population, but a lot of them have served a trick in that occupation before they take final vows."

They arrived at a small courtyard, behind which stood a massive stone-

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and-log house. Two swordsmen stood in the courtyard, and opened the iron gates when they saw the bishop, then went back to their posts, lounging carelessly against the gate pillars.

"Two weeks arrears in their pay," Deluca told Nathan. "It is strange. Many men in this city have nothing to eat, and you would think they would be glad of duties where they were well fed and had at least some money, but more and more throw themselves on Temple charity, work in the streets when they work at all, refuse honorable employment. The city has lost its heart."

MacKinnie nodded. The barbarians were at the gates, but the men of the city either thought themselves lost already, or refused to think about it at all. Only the Temple kept the enemy at bay, providing whatever spirit Batav had been able to muster. Nathan doubted that even the iron-willed Temple believers would be able to hold things together for long.

The inside of the house was sparse, showing both the lack of funds which had furnished it and, perhaps, the austere temperament of the archbishop. MacKinnie was shown into the great hall, where His Eminence sat in ragged splendor, staring at the dying embers of a fire which was not really needed to heat the room.

"As we supposed, Your Eminence," Laraine said, "the ship was from the West. And more than we dared hope, it is owned by men from the Empire, although by their accents they are from a part I have never visited. A Colony world?" he asked, turning to MacKinnie.

"I didn't ask your origin when I offered to help you, My Lord," Nathan replied. "Is it necessary to discuss *mine*? The Empire contains many worlds, and the citizens of some are more fortunate than those of others. But despite the contempt the Empire feels for my world, it is my ship and my gold which can save your lives. We may even be able to help you in the work you came to do."

Deluca gasped, but before he could speak the archbishop said, "He speaks well. Let him continue, for God often sends help in strange disguises. Our work is with the sons of all men." The old man waved toward a chair. "I gather that you have no way of calling the Navy to assist us?"

"We were not permitted such devices, My Lord," MacKinnie answered.

The archbishop nodded. "A Colony world." He nodded again. "The Navy could do nothing even if you could call them. Once we are dead, they will send a punitive expedition, and the Imperial Traders Association will be the loudest voice in demanding vengeance for the deaths of the priests of the Lord. The Church has more than once been used as a pretext for Empire."

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"I do not understand, My Lord," MacKinnie said.

"The Emperor has no wish to conquer these worlds." At MacKinnie's puzzled look, the old man halted. "Bring our guests something to drink." He turned to MacKinnie. "You know nothing of Imperial politics. Are you a member of the Church?"

"New Rome has not yet come to my world, My Lord. We are Christians, more or less. I was baptized into the orthodox church, which I am told is acceptable to New Rome."

"Forgive my curiosity, it was not idle. It follows that you know nothing of Imperial politics. What are you doing on Makassar?"

"My king has sent me to head a trading mission, My Lord. He rules the largest civilized country on my home world, and is allied with the Imperial ambassador. The Navy is aiding him in the subjugation of the planet."

The archbishop nodded. "But you are not a trader. Nor are any of these with you. Please, do not protest. You cannot deceive a man of my years. You are a soldier, and these others, what are they, spies? It does not matter. And here you are, on this primitive planet, having come from a world which is itself primitive . . . and you talk of aiding us! It is admirable, but I fail to see what you can do. Still, such courage should be rewarded, if only with information."

He paused as servants brought wine and additional chairs for the others. "This is not very good wine," Deluca said. "But it is all we have here. The Trader has far better on his ship."

"Wine does not make the day," the archbishop told them. "It is only a vehicle. Look at them, Father Deluca. Barely able to speak the Imperial language, knowing nothing of the Capital and its ways, voyaging across space in ships they cannot understand . . . if the Church could bring men to as much faith in her teachings as these men have in themselves!" He tasted the wine and grimaced.

"You and I have the same mission, My Lord Trader," he told MacKinnie. "We are agents provocateur, sent to aid the Imperial Traders Association. The difference is that I know it, and you do not."

"I do not understand."

"I did not expect you to understand. You believe you are here for some other purpose, some great mission to save your own kingdom perhaps, certainly something more important than bringing back gold for your planetary king. And we are here to bring these people back to God. But both of us will serve the ITA as surely as we would if they had hired us."

The room was still as they waited for him to continue. "The Navy will not permit the traders simple conquest. I am sure that you know that no good military force will fight for a standard of living—their own or

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anyone else's. It takes God, not gold, to put heart in a soldier. The Navy fights for a cause, for the Emperor and the Church, for New Annapolis, but never for the ITA. The Navy will not simply come in here and set up kingdoms for the Traders.

"So they use us. They get us sent here, and prevent the Navy from giving us protection . . . but after we are slaughtered, it will be the ITA delegates who shout the loudest for vengeance. 'Have to teach the beggars a lesson', they will say. And the same for you Colonials . . . back on your planet there is opposition to the Empire. I don't have to know where you come from to know that. And Imperialism won't inspire much loyalty. The ITA will find them troublesome. But the really troublesome people will be the most patriotic . . . do you think they will not join when the ITA recruits them for a merchant army to punish this planet? To revenge you? Neatly solving two problems, the conquest of Makassar, and the removal of leaders and soldiers from wherever you come from. It is an old and tested formula, and it works."

"Why do you permit them to use you, My Lord?" MacKinnie asked.

"Whatever your reasons, would you have refused to come here if you had known?" The archbishop answered. "I thought not. Nor could I refuse to bring the Word of God to the heathen." The old man coughed, his thin shoulders shaking violently. "Now go back to whatever plan you have, but remember the ITA. They have large resources, and they have power, but they have no virtue. One day the Navy will tire of being used and kill them all, but others will spring up in their place. There is always the ITA."

"I thank you for your frankness, My Lord. Academician, have you anything to say?" MacKinnie added, turning to Longway.

"Not at the moment. I need time to think of all this. I am much afraid the archbishop is correct. You see the counterparts of the ITA in King David's court. The money grubbers are everywhere."

"My Lord," MacKinnie asked, "if we can aid you in bringing these people to the Church, and yet give the Traders no reason to demand Navy intervention here, can you help us?"

"With what?"

"At the moment, I can't tell you. It isn't my secret, and I'm not sure what you can do in any event."

"I am not unwilling to help you in principle . . . but before you ask it, remember to whom you speak. I am an archbishop of the Church. I am cynical about some of the Church's officers and many of the Imperial advisers, but do not be deceived. I am a loyal subject of the Emperor and a servant of the Church."

MacKinnie nodded. "I would ask nothing dishonorable. We can talk about these things later, now I had better return to my ship."

The old man stood and offered his

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hand, and after a moment MacKinnie knelt to kiss the great ring. As they left they saw him raise his hand in blessing, muttering words in a language MacKinnie had never heard.

XII

For three days, MacKinnie studied the barbarians. He stood at the walls of Batav, looking out across the low rolling hills and fields, watching as the maris rode swiftly from gate to gate, watching them camp almost within bow shot of the city, their tents and wagons contemptuously near the gates. Once a small party of armored men from the city attempted to attack the enemy camp. The heavy Temple cavalry charged forth, trampling the light armored enemy beneath the hooves of their horses, swords hewing a path through the barbarians. But slowly the charge faltered as more and more of the enemy raced to the fray, then the Temple warriors vanished in a sea of swarthy men, and the plain was still once more.

After the disastrous battle, MacKinnie asked for audience with the Temple hierarchy, claiming that he had valuable information about the war which he could reveal only to a high officer. Meanwhile, Stark drilled *Subao*'s crewmen, forcing them to practice with sword, pike, and shield, marching in formation to the beat of drums, throwing javelins and firing crossbows in volley, and always marching, holding formation as they quickstepped about the pier. Their activities attracted notice from the officers of the Temple guard, and on the tenth day in Batav a small party approached the ship.

"We are to conduct you to the Temple," MacKinnie was told. He was ushered to the gates by the officer, then turned over to two gaily clothed attendants who guided him through lavishly decorated halls, up stone steps to a cell set into the wall high above the Temple courtyard. A black-robed priest sat at a small table, quill pen and inkpot before him. A litter of parchments was strewn about the room, and on the wall behind the priest hung a large map of the city and countryside, roads and villages sketched in detail to a distance of fifty kilometers from the walls.

"Father Sumbavu, the outlander you asked to see," the Temple attendant said. "He calls himself Trader Captain MacKinnie." The man stumbled over the pronunciation but managed to say the name correctly.

Nathan had been told that Father Sambavu served as Minister of War for the Temple. There were others who ranked far higher, but few had more power. Sumbavu seemed to care little for the miter of a bishop, and less for the trappings of power, but his men served him without question. Nathan noted the contrast between the sparsely furnished cell and the richly decorated rooms of the Great Hall of the Temple. His cell was placed in the high battle-

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ments, and the narrow window looked across the city, to the wall, and beyond to the barbarian camps. Nathan could see small bands of them riding endlessly around the gates, staying just out of bow shot. Low rolling hills, covered with grass and dotted with grainfields stretched out to the horizon. A few roads crossed the plains, and the ruins of burned villages stood at their crossings.

The priest raised his hand perfunctorily in the ritual blessing, and MacKinnie bowed. Before he could straighten the priest asked, "Why do you waste my time?"

"But you asked to see me, Father."

"You asked to see a member of the hierarchy. You say you have information about the war. Now you are here. What have you to tell me?"

"Your Worship, I have some experience with fighting these barbarians. In the east, they have been driven from city gates. Although I am but a trader, I have commanded men in battle against these plainsmen, and I wished to find if our methods have been tried. We drove them from the gates in the South." MacKinnie stood as stiffly as a cadet on parade, waiting for the man to speak again, but there was only silence. Nathan studied the priest at length.

He could not tell the priest's age. The face showed no lines, and there was no gray to the closely cropped hair, but the hands were worn, with work and perhaps with age as well. Sumbavu returned the intense gaze, then said, "Why do you think you can do what we cannot? We have the finest soldiers on Makassar, and they have done nothing against these hordes. We have always beaten them back in the past, but there are too many of them now." He rose and stared out the stone window, his hands clinched tightly.

"It is not the quality of the soldiers, Your Worship, but their manner of fighting. Your guards have excellent discipline, but there are not enough of them. Your lords fight splendidly, but the cavalry is never properly supported to fight against these plainsmen. I have seen little of your cavalry—they have mostly been killed have they not? I saw fifty of them taken."

"Those not dead live in the city. There were not many at any time, and they have lost hope. Three times the armored servants of the Temple and the men of the great families rode out the gate. Three times they charged and nothing stood before them. And three times they were defeated, cut off, scattered, driven like straws before the winds, the few riding back into the gates in shame. There are always more of the barbarians, but there are never more of the sons of the great families. And you say that you can do what our greatest warriors could not? Have you perhaps a thousand ships at your back, bringing a new army?" He looked closely at MacKinnie, then motioned to a hard wooden chair.

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"Enjoy what comforts I allow myself and my visitors," he muttered. "There are few enough. And tell me how the men of the south defeat barbarians."

MacKinnie sat and chose his words carefully. "It is a matter of combining the foot soldiers and the mounted men so that they support each other," he told the priest. "When they are combined properly, the barbarians cannot defeat them."

"There are not enough soldiers," Sumbavu said. "No matter how clever you may be, you cannot make a few win against thousands."

"True enough, Father. But we can make each man do the work of ten. And there are the idlers of the city, the hireling swordsmen, the thieves, the people of the city. They can fight."

The priest shrugged. "If they would. But for each of them you drive into the battle, you must have a loyal man to watch him and keep him from running. It is not worth it."

"If they are treated as men, and trained properly, they can fight. We do not need many. But they cannot be treated like cattle or slaves. They must be free soldiers."

"You propose to give arms to the people? You would destroy the Temple!"

"No, I would save it. The Temple is doomed, Father Sumbavu. You are as aware of that as I." MacKinnie gestured toward the window. "The City will fall within the yir. I have seen the empty docks, and I am told of the harbors closed against you. I see the people sleeping in the streets while the barbarians harvest the crops. You cannot drive the enemy away until he has eaten everything in your fields. Their supplies will last longer than yours. Your Temple is doomed unless you can drive away the enemy."

Sumbavu struggled to keep his icy calm, but his hands moved restlessly across the desk. "And only you can prevent this? You are indeed a man blessed by God. We have held this City for five hundred yirs. What have your ancestors done? Lived in dirt houses?"

"What we have done is no matter. It is what we can do."

"And how will you go about saving the city? What is your price?"

"I have no price for saving the fountain of all the wisdom on Makassar. I ask only what I will need. Weapons. Pikes and shields. Authority to recruit men. And I will have to inspect the soldiers, talk to the heavy cavalrymen. I will require a drill field to practice my men. And the men on Temple charity must be brought to it, so that they can be armed. I have no price, but I have much to do. We can save this city and the Temple if you will but listen."

The priest spread his hands and looked intently at his palms. "Perhaps it is the Will of God. There is no other plan. It can do no great harm to allow you to train these

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rabble, for when you and they are killed that will be all the longer our rations will last. I will see that you get what you need."

Gradually, an army was formed on the parade ground outside the Temple. In the first week, the men had to be driven to the drill field, stumbling through their paces, unable to understand and unwilling to work. But as they were given weapons, a new respect for themselves slowly pervaded the ragged group. Men who had recently been beggars found themselves alongside sturdy peasants from outside the walls, and mixed among them were younger sons of merchant families ruined by the siege. Under MacKinnie's pleas and Stark's driving, they began to hold their heads higher, to thrust their pikes into the target dummies, even to scream war cries. After the third week of training, MacKinnie called a conference.

"We don't have long," he told the group. "Sumbavu is anxious to know what we are doing, and I have to report to him. You want to be careful of that man. He's a lot sharper than he looks or acts. What's the status of our army?"

"The infantry's so-so," Hal reported. "Them Temple troops are fine, but they don't know what to do and they're so sure of themselves they don't want to learn anything new. The people's army can carry pikes and hold up their shields if you don't want them to do it for too long. Weak as cats, most of them. And we'll never get any archers out of that crowd. The Temple's got a fair number, and that's all you'll have."

"Can they hold against a charge of light cavalry?" MacKinnie asked.

"Don't know, sir. They'd never stop the heavy stuff, but they might hold against the plainsmen if'n they believed in themselves enough. But they got no confidence, Colonel."

MacKinnie noted Longway's start at Hal's slip, but said nothing. "What of the cavalry?" he asked Brett. "Can they fight in formation? Have they had enough of that cockiness beat out of them to make them a disciplined force, or are they going to go charging out into the enemy and scatter?"

"Vanjynk and I have talked to them, Trader," Brett replied. "But their honor is all they have left. Still, these were men who have been beaten before, and after all, it is only barbarians they fight . . . but it will be difficult to call them back from victory."

"You'll have to," MacKinnie said. "It's the only chance any of us have. Those men have to be taught to charge home, re-form, and get back to the shield walls. Any of them that try the grandstand act will be left out there dead. Try to drive that elementary fact through their heads. And add to it the fact that if they're killed their city falls and the whole honor system they're so proud of goes with it. They're fighting to preserve their honor."

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"Yes, but by means which to them are dishonorable," Vanjynk said. "They listen to me as one of them, and I have faithfully told them what you desire. I have even come to believe it. But it is strange to them."

MacKinnie nodded. "Strange or not, they'll have to learn. Now what about the commissary department?"

"We have some supply wagons," Mary Graham said. "And there is plenty of forage out beyond the walls. If you can protect our baggage trains, we can supply your men for a few days. There won't be a lot to eat, but something. We might even be able to harvest some grain if our farmers are protected."

"So we have a partially disciplined force of infantry, some cavalry who may be useful and may not, some Temple archers and guardsmen who are our best soldiers but don't understand what's needed, and one whole hell of a lot of barbarians. An interesting situation." He thought for a few moments, staring down at a copy of Sumbavu's map young Todd had laboriously made, then came to a decision. "We need a demonstration. I'll give each of you a week to select the best men you can, men you think won't break and run and who will obey orders. I'll need provisions for about two days for twice that number of people, and a group of your best disciplined cooks and camp workers," he added to Mary. "We're going to make a show of force against the enemy. The primary purpose will be to convince our own troops that we can beat barbarians." He stood, dismissing the meeting. "Hal, stay with me for a moment, please."

When the others had left, Stark said, "Sorry about the slip, Colonel. It's too much like campaign, and I ain't used to being a spy."

"We'll survive. Have you picked the headquarters group?"

"Yes, sir. Using the troops we brought with us as a steadying force we've got a pretty loyal company. I think they'd fight the Temple people for us if'n they thought they could win. Anyway we can control them. You lead 'em to a victory, they'll be yours for sure."

"Excellent. We must have that headquarters group, or when this is over there won't be any point to it all. All right, Sergeant, you can go."

Hal stood, grinned for a moment, and saluted. "Old times, Colonel. Different Wolves, but old times."

MacKinnie carefully armed himself before visiting Sumbavu. He struggled into chain mail, threw a bright crimson cloak over his shoulders, donned gold bracelets and necklace, and fastened his surplice with a jeweled pin before buckling on a sword made on Prince Samual's World. The mail and sword were better than anything they had encountered on Makassar, although reasonably similar in design, and their possession imparted some status to MacKinnie's group. Sumbavu was standing at the battlements

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above his cell when MacKinnie was brought to him.

"You betray true colors, Trader," the priest said. "You are more the soldier than the Trader, are you not?"

"In the South, Father, traders and soldiers are the same thing. At least live traders are. There's little peace there."

"Or here. It was not always thus." The warrior priest looked out across the great plain beyond the city wall. "There are more of them today. The grain is ready for harvest, and they are formed to protect it from our fire parties. We could burn the crop, but only at the cost of the balance of our knights. I do not think any would return to us alive."

"Yet there may be a way, Father," MacKinnie said. When the priest glanced quickly at him, he continued, "I wish to take a small party outside the walls. We will not go far."

"You may take as many of your useless mouths as you please. You have made them march with their heads up, but they are not soldiers. They will never be soldiers."

"I need more than my peasants," MacKinnie said. "I will require fifty archers of the Temple, and fifty mounted men."

"A fourth part of the archers? And nearly as great a part of the knights? You are mad. I will not permit it."

"Yet, Father, it is worth doing. We will show you how the barbarians can be defeated. And we will not go far from the walls. The archers and knights can seek shelter there if my men do not hold—and there can be no loss of honor if they retreat because others failed them."

"Where will you be?"

"With the spearmen at the van."

"You risk your life to prove these men? You believe, then. Strange."

MacKinnie looked across the plains, to see another band of barbarians approach the walls. There seemed to be hundreds in the one group alone.

"You will take your men into that," Sumbavu said. "You will not come out alive."

"But if we do? It will put heart in the others. Remember, if we do nothing, the Temple is doomed."

"Yet if you slaughter my archers and knights the doom will fall the faster . . ." The priest studied the camps below, watching knots of horsemen dart toward the walls, then turn away just outside the range of the archers at the walls. He fingered his emblem, a golden Temple with ebony black cross surmounting it, and turned suddenly.

"Do as you will. You are mad, but there are those who believe the mad have inspiration from God. It is certain that I have none." Sumbavu turned and stalked away, age showing in the set of his shoulders.

XIII

MacKinnie used a week training the picked men for the sally. Finally

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Hal reported that they were as ready as they could be in the time they had, and assembled them in the marshaling square just inside the gates. His cloak streaming behind him, Nathan mounted the small dais near the gates to address the men.

"You will win today a victory such as has never been seen on this world," he shouted. "There will be no end to the songs of this day. Your homes will be saved, and you will come to glory. Besides, what life is there huddled behind walls? What man hides from his enemies when he can go out and kill them? Today you are all men. You will never be slaves again."

There was a feeble cheer, led by Hal's picked guardsmen scattered through the ranks.

"It'll have to do," Nathan told his sergeant. "They won't believe much of anything until they see they can hold the enemy. But will they fight long enough to find out?"

"Dunno, Colonel," Stark answered. "We've done all we could with 'em, but most of the spirit was beat out of 'em before we got here. They might."

"They know what to do," MacKinnie said. "Now it's up to us to make them do it. Get them in ranks and open the gate."

"Yes, sir."

The army was formed as a wedge, spear and shield soldiers at the edges, the cavalry, archers, and supply wagons inside. Picked men held the point, which was rounded to be as wide as the gate would permit. They were to march out in a column, with the sides moving swiftly on the obliques to make the triangular formation they had practiced on the Temple drill field. The crimson uniforms of the Temple archers and the gaily colored armor of the knights formed a brilliant contrast to the drab leather garments of the pikemen as they stood in ranks, waiting for the gate. Wherever possible, the men in ranks wore breastplates, helmets, greaves, but there were not enough to equip all. Some had only spear and shield, with a small dagger in their belts.

At MacKinnie's wave, the gate opened. "Move out!" Stark shouted. "Keep your order. Just like on the drill field. Get in step, there."

Young drummers scattered through the reserves tapped cadence as the small force sallied out the gate. When enough of the spearmen had emerged to form a shieldwall, MacKinnie sent out the cavalry, then strode swiftly through them to reach his post near the point of the formation.

They formed ranks within the protective fire of the archers on the walls. A few of the barbarians charged toward them, but were cut down before they could reach the sallying force. The rest of the enemy stayed well out of range, watching, while thousands more rode swiftly toward the gate.

"Lot of 'em out there," Stark remarked. "Looks like all of 'em. Too

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bad you don't have another sally set up for the other gate."

"There're few enough troops here," MacKinnie muttered. He was grimly watching as the last of the army emerged from the gates and swung across to form the base of the wedge. "All right, Hal, move them out."

Stark signaled to the drummers. The cadence changed, and a drum signal echoed down the line. The men ceased to mark time and slowly marched forward, shields held level, spears thrust forward. Behind each shieldsman were two ranks of pikemen. They marched across the gently rolling plain toward the nearest enemy camp, slowly moving from the protective fire of the city walls.

"Here comes the first bunch," Stark said pointing to a group of nomads charging across the field. "They're going right around to hit young Todd's section. Put the archers on 'em?"

"Two squads, Hal. Let the others fire at high angle to keep the rest away. Todd's men can hold that group."

"Yes, sir."

Volleys of bolts shot from the Temple archers, cutting some of the enemy from their wooden saddles. Then the first barbarians hurtled toward the shield line, not in a wave but in scattered groups.

Before they made contact, Todd shouted orders. The drum cadence changed, and the line of men sank to one knee, spears grounded, the pikemen thrusting over their heads. The maris hurdled closer, shouting, cheering.

A barbarian mare screamed as she was impaled on a spear. Other beasts whirled from the thicket of points, getting in the way of men charging behind them, stumbling within range of the thrusting pikes, until the barbarian group was milling in front of the right leg of MacKinnie's wedge. Archers poured fire into the mass of men and beasts. The enemy shouted defiance, broke against the shield wall again, again.

"They flee, they flee!" someone shouted.

"After them!" MacKinnie heard.

"Hold your positions!" MacKinnie shouted. "By the Temple God I'll have the archers cut down the first man who breaks ranks! Brett, keep those damned knights of yours under control!"

"Yes, sir," he heard from among the cavalry in the center of the wedge. The knights were milling about, anxious to give chase to the fleeing enemies. The maris thundered away, wheeled to shout defiance again, then rode off when no one followed.

When calm returned, MacKinnie mounted a wagon. "You've driven off one small group. It wasn't much of a battle, but you see it can be done. Now don't let them make fools of you. If you break formation or leave the shield wall, they'll be all over you. Stand to ranks and you'll

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slaughter them. Remember, every man's life depends on each of you. No one must break, not for cowardice, and not for glory. And by God, raise a cheer!"

This time the response was great. As MacKinnie climbed down from the wagon, he recognized its driver, shouting at the top of her lungs.

"Freelady!" he called. "You have no business here."

"You gave me the commissary to organize, Colonel. I have done it. There was no one here fit to command my ragtap group, and I will not have my work undone by incompetents. Your sergeant himself dismissed that oaf from the Temple who tried to drive my men like slaves."

He looked at her carefully. She wore the armor made for her on Prince Samual's World, and carried a sword on the wagon box next to her. As he studied her, he saw one of the commissary cooks watching him, fingering his weapon, an enormous meat ax.

"You leave the lady alone," the burly man said. "She's a saint from heaven. You touch her, and commander or not, you die."

"Sumba, thank you, but I don't need protection," Mary protested. "At least not from him."

"That's all right, my lady, we'll watch them all," the stocky cook said. MacKinnie shrugged and returned to organize the battle.

The group marched forward again, the drums measuring a slow beat. From time to time a group of the enemy would gallop towards them, firing arrows, only to be driven away by the Temple archers. The barbarian's stubby bows were useless against even the leather of the unarmored men until they came to close range, and they did not dare come very close.

"They'll re-form for another try," MacKinnie said softly. "This time they'll try a mass charge with everything they've got."

Stark nodded. "The men have some confidence now, Colonel. I think they'll hold. It was a good thing, them trying a small attack first."

"Clan rivalry," Longway said from behind them. "I've seen it on South Continent. Each clan wants to be the first to remove the insult of our presence. But they'll be back."

"Night's what worries me," Stark said. "We going to stay out here all night?"

MacKinnie nodded. "The whole point of this demonstration is to build up the morale of the troops back in the city. Just moving out and coming back won't do any good. We have to have a solid victory."

"I still do not see what we are accomplishing," Longway said. "Suppose you prove that you can take the field against the barbarians and move about in formations they can't break. All they have to do is avoid you."

"We'll cross that one later,"

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MacKinnie muttered. "Here they come, Hal. Get the men ready."

A flood of the enemy galloped toward them across the low plain.

"Thousands, thousands," someone in the ranks shouted. "We'll never stop that charge!"

"Quiet in the ranks!" Stark ordered. "Beat to arms, Drummers!" The tattoo thundered through the small formation. The shieldsmen dropped to one knee again, this time the entire perimeter sinking low, with the pikemen thrusting their weapons over the tops of the shields. A small knot of reserve pikemen stood at each corner of the wedge, while Brett's cavalry milled about. The archers fired into the oncoming horde as the cooks and camp followers struggled to load crossbows and pass them up to the bowmen. Every bolt took its target, leaving riderless horses to run aimlessly, bringing confusion to the enemy charge.

"They ain't got what you'd call much formation to them," Stark observed coldly. "They'd do better to all come at once instead of in little bunches."

"Insufficient discipline," Longway said. "They've more than the normal on this world, but that isn't much."

As the drums thundered to crescendo, the charge hit home. On all sides barbarians plunged and reared, unable to penetrate the shield walls, milling about in front of the wedges, while crossbow bolts poured out.

"Swordsmen! Swordsmen here!" McLean shouted from his station as commander of the rear section. At his order, a dozen men with short swords and bucklers ran to his aid, throwing themselves into a gap in the line, thrusting five dismounted barbarians out into the seething mass beyond. A knot of pikemen trotted to station behind them, while the formation closed ranks over the bodies of five shieldsmen, killed when one of their number turned to run.

The maris called to their companions, withdrew a space, and charged the weak spot in the line again.

"They're massing back there against McLean," Stark reported. "Getting hard to hold."

"Prepare the cavalry," MacKinnie said softly. "I'll go get McLean ready."

MacKinnie ran across the thirty meters separating the point from the base of the wedge. "Prepare to open ranks, McLean."

"Aye, Colonel. Drummers, beat the ready." The drum notes changed subtly. "Fuglemen, pace your men!" The seaman's voice carried through the din of battle, and they heard the orders rattle down the ranks. MacKinnie eyed the situation coolly.

"Now, Mr. McLean."

"Open ranks!" McLean commanded. The shieldsmen sidestepped, bunching up on each other, leaving a clear gap in the center. The enemy shouted in triumph, pouring toward the gap.

The rich notes of a trumpet sounded from the center of the formation. Slowly, gathering speed,

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ponderously, the heavy cavalrymen trotted across the wedge from their gathering place at the point.

They built up speed, lances were lowered, and they drove into the advancing enemy, using the maris's own momentum to add to their own, sweeping everything before them, riding the enemy down under the hooves of their beasts. Brett and Vanjynk, at each end of the first wave of knights, sounded a cheer as the heavy armor of the iron men proved too much for the light-armed maris. The barbarians scattered and swordsmen poured into the gaps, running alongside the knights, slashing down the enemy, killing the dismounted. The charge pressed onward, the knights scattering to pursue the enemy. The tight formation broke up, and the maris withdrew, formed in tight knots.

"Sound recall." MacKinnie ordered. The trumpet notes were heard again, this time plaintively, disappointed. "Sound it again!" He turned to Stark. "This is the turning point, Hal. If Vanjynk and Brett can't control those brainless wonders, we've had it."

He saw his officers shouting to the knights. Slowly they began to wheel, first one, then another, then the entire group. For a moment they paused, and MacKinnie saw that Brett was actually dressing their ranks, before they rode in, proudly, contemptuously, in perfect order, their pennants fluttering from their lances, while the shield wall closed behind them over the bodies of a hundred foes.

MacKinnie drove them relentlessly on, across the plain toward the first of the nomad encampments. Twice more they withstood a massed assault from the maris, the column halting to plant spear points in the ground. The second attack was heavy enough to cause MacKinnie to order the cavalry charge again, breaking through the concentrations of the enemy before wheeling around to recover their position within the shield wall. In each battle they left a pile of enemy dead to be crushed beneath the wagon wheels as the column marched on.

They reached the enemy camp, a group of leather tents stretched across wooden frames, a few wagons which the barbarians pulled to safety before the army arrived. A thin wall of men with light shields stood in front of the camp. Brett and Vanjynk rode forward to MacKinnie.

"We can scatter them with a single charge!" Brett shouted. "Open the ranks."

"No. I will not risk our cavalry in a charge beyond the shield walls. There are too few men for that, and we would never return to the city if something went wrong. We march together or we die together. Would your knights abandon us?"

"We would not leave you though you stood alone among a thousand enemies." Vanjynk said quietly. "I

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have been talking to the knights. Not one of us has ever seen the like of this day. We have left more of the enemy behind us than we number. Each time we fought them before, our charge would carry them away until suddenly they swarmed about us to cut us down. We will stay with you."

The column moved forward, cautiously but inexorably, the drums giving a slow step as the pikemen advanced. MacKinnie rotated the formation until the point was aimed directly at the enemy, then massed his reserve pikes behind the leading men. His archers were silent, their store of bolts nearly exhausted. MacKinnie spoke quietly to the Temple officer who commanded them.

"A full volley on the men to the right of our point," he said deliberately. "I want a hole driven in their formation. They can't fight as infantry, they aren't trained for it, and they don't like it. We'll break through and roll up their flanks."

As they approached nearer, MacKinnie gave a signal. The archers fired their volley as Todd led a knot of swordsmen forward, cast javelins at the enemies in front of them, and retired behind the forest of pikes. The leading elements of the column struck just behind the javelins, tearing through the thin line by sheer momentum, before the first rank of pikemen fell into a hidden pit behind the maris. Their screams echoed up from below.

"That's what you would have ridden into," MacKinnie told Brett softly. "I thought there was a reason they'd stand like that. They were hoping for a full charge of cavalry."

The barbarians broke and ran, gathering their mounts from hiding places behind the tents and galloping away. Mary Graham's auxiliaries hauled the wounded men from the pits below, leaving five pikemen impaled on stakes set in the ground. She turned pale as she stood looking into the grisly trench, but Nathan had no time for sympathy.

"Bury them here," MacKinnie ordered. "It's an honorable enough grave. Send for the chaplain." He moved about, setting the shield wall in place.

A small scouting party entered the enemy camp, to return with excited reports. "There is much food here," one said. "But we must enter with great care, for they have tethered scarpias on the walls and ridgepoles." The scarpia was a warm-blooded lizardlike creature four to ten centimeters long. It faintly resembled the earth scorpion, and its bite was nearly as deadly.

"We will camp beyond the enemy tents," MacKinnie ordered. "Use their ridgepoles to add to our stakes, and be sure to set the stakes carefully. They may attack at night. Bring as much food as you can carry for the city."

Under Stark's direction, the battalion built a fortified camp, digging ditches around the perimeter, throw-

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ing the earth to the inside and placing stakes at the top of the rampart they formed. They worked in shifts, every other man using his shovel while the rest stood in ranks holding the diggers' shields and weapons, but there was no renewal of the barbarian attack. The maris rode endlessly around the perimeter of the camp, just outside bow shot, darting in to fire arrows and wheeling away before an answering volley could be launched. MacKinnie ordered the men to ignore the harassment.

"They'll get close enough to fight before the night's over," he told them. "They can't do us much harm from the range they're shooting from. You'll get your chance later."

It was dark before the cookfires were lighted, but MacKinnie would not allow any rest until the camp was completed. When the last stake was driven, the sun had set, and a thick overcast obscured the moons. From his command point atop Mary Graham's wagon, MacKinnie could see dozens of fires dotting the plain, barbarian camps, each a band of hundreds of men.

"There are sure enough of them," he remarked.

"I don't see how we can win against so many," Mary answered. "No matter how many you kill, there will always be more."

"Not if there's nothing to eat. They're foraging pretty wide already. It's only the grain crops that enable them to stay here. Without the crops, they'd have to go back into the interior. We'll drive them off all right."

"What were you a colonel of?" she asked. "I thought you were more than just a trader from the time I met you, and I wasn't very surprised when your man let it slip."

"You've heard of me," he said. Out beyond the palisade, something was moving. The nearest enemy cookfire was obscured momentarily, then again.

"You mean your name is MacKinnie? Let me . . ." She looked up in surprise. "Iron MacKinnie? The Orlean commander? I should hate you."

"Why?"

"My fiance was at Blanthern Pass. A subaltern in the Fifth."

MacKinnie climbed laboriously from the wagon, surprised at how tired he was even in the low gravity of Makassar. "The Fifth were good troops."

"Yes. They'd have won against anyone but your men, wouldn't they? I think everyone in Haven hated and admired you at the same time after that battle."

"It's done. Now we're all loyal subjects of King David. I'm sorry."

"Don't be." She moved closer to him, trying to see his face in the dim light from the cookfire. "From these millions of miles away, the big important politics of Prince Samual's World look pretty small. Until today I was sure we'd never get back home. Even now it doesn't seem very likely.

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But if anyone can do it, you can."

Nathan laughed. "You're beginning to sound like Hal talking to the recruits, Mary Graham. For now you'd best get the men fed, because we don't have very long before the barbarians try their hand with a night attack. I'll have the troops sent here in shifts so we keep a decent perimeter, and we feed the interior troops last. It's the pikemen and shield boys we want to take care of tonight."

"When do the knights eat?"

"After they've fed their mounts like any good cavalry. And after my pikemen. Your pardon, Freelady, I have to see to my men."

The night wore on. MacKinnie was relieved when no attack came before his perimeter guards were fed, but did not relax until every man was back in his place, lying at ease with his weapons, while swordsmen stood guard to peer futilely into the darkness.

"They're coming," he told Stark. "I've seen them stirring around, and there's a feel about it. You get it, too?"

"Yes, sir. And like you say, they're moving about some out there. We'll hear from 'em 'fore morning."

It was nearly midnight when a sentry shouted, then vanished beneath a wave of dismounted men swarming toward the palisade.

"Trumpeter!" MacKinnie shouted. "Sound the alarm! To your feet men!" He could see a knot of pikemen, kept awake in central reserve, rushing toward the area of the attack.

"To me! To me!" he heard Vanjynk shout. "Leave your mounts and rally to me!" Leading a party of knights with swords singing about their heads, Vanjynk charged to the perimeter, pushing aside shieldsmen struggling to their feet. The iron men stood at the top of the palisades, dealing terrible blows to the enemy attempting to climb out of the ditch. The night was filled with screams and shouts before MacKinnie had his shield wall formed properly and brought the armored men back to a central reserve.

"They're all around the perimeter," Stark told him. "They try one spot and then another, not much coordination to it, but nobody can rest any, Colonel."

MacKinnie nodded agreement. "It's a good tactic. They hope to tire us out and then cut us off from the city. It'll cost 'em enough."

In less than an hour the battle died away, leaving a quiet shattered at intervals with the groans of the wounded, but the enemy never left them alone. All night there were rushes against one part of the palisade or another, and the whistle of arrows fired randomly into the camp. Morning came slowly, to reveal hundreds of enemy dead and dying filling the ditches, or stretched on the ground where they had crawled away from the battle. Bands of no-

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mads rode slowly around the camp, silently watching the wall of shields.

"Here's the tricky part," MacKinnie said. "But I think they may have had enough for now. They'll want to see what we do next." He carefully moved his men out beyond the palisade, bringing the wagons and interior troops out of the camp before abandoning the other walls. The enemy watched, but there was no attack, as he marched his formation slowly back through the enemy campsite, burning everything he could find. As the maris's possessions blazed behind them, the battalion marched in quickstep back to the city.

XIV

The war minister was angry as he faced the assembled Bishops of the Temple. "He has proved that he can fight the barbarians. He has remained a day and a night outside the walls of the city. He has killed hundreds of them. For this we are grateful. But I say that it is madness to take the entire army into the field. Let him carry on his raids with the troops he used before, not strip our walls of their defenders."

The council muttered approval. MacKinnie glanced around the great room, its walls hung with tapestries. Above the woven hangings, stone figures representing heroes of an Empire dead so long its very existence was legend stared down at them. On his dais high above the council table, His Utmost Holiness Willem XI dozed in starts, interest overcoming senility for moments before his head dropped again. His word was law, but the Council of Bishops wrote his words for him, and spoke them as well more often than not.

"Worshipful sirs," MacKinnie said, "I would do as Father Sumbavu asks if it were possible. But our expedition was a demonstration only. Without sufficient troops to replace the shieldsmen who fall in battle, and more to allow the men to rest when they tire, we could never hold against the enemy for more than a day. But with enough men I can destroy their bases of supplies, bring them to battle against us, destroy many of them and send the rest to their wastelands. And do not be deceived, worshipful sirs. The plainsmen have studied our methods of fighting. They now will even be devising means to fight us, to use their great numbers and speed. The next battle will decide the fate of the city. Would you fight it now, or wait until hunger has reduced our ranks to shadows? Will you fight outside the walls like men, or huddled inside waiting to be slaughtered?"

"He speaks well, Sumbavu," the archdeacon said. He turned his blue eyes toward MacKinnie. "And how do you know you will have success? What manner of Trader are you that you know ways of fighting never seen on this world?"

"Your Reverence, my ways are

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but those of the Guildsmen of the South and West. We have fought these barbarians before, although never so many of them. As to success, what can be denied the army of God? If we go forth boldly, we must win, for God is with us."

"He was with us before, but it did not save our army," Sumbavu muttered. The old priest glanced quickly about, fearful of having spoken heresy.

"You wish to take all the knights and archers, and your beggars," the archdeacon said. "This I understand from watching the fighting five days ago. But why do you also demand the swordsmen of the Temple? Of what use will these be to you?"

"The armored swordsmen will guard our camp," MacKinnie said. "They will fight in the nighttime when the shieldsmen are not of such great value. They fight against the barbarians when they leave their mounts and attack us on foot. The

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citizen army knows only one method of fighting, they are not trained soldiers. We must have a leavening of fighting men if we are to bring the enemy to the final battle."

"And Sumbavu, what have you to say except that we should not allow this? What reasons have you?" the crimson-robed official asked. "He has done what you could never do." The archdeacon turned to the others. "For myself, I see the hand of God in this man's coming. Who knows what instruments the Omnipotent may choose for our deliverance?"

Sumbavu measured his words carefully, speaking softly so that they leaned forward to hear him. "I do not know. Yet I do not like this. There is something of this man I do not understand, and I do not think he should be trusted with the army of the Temple."

"Then go with him to command it," the archdeacon said. "For ourselves, we have heard enough. Let the Trader kill the barbarians, and may God's blessing go with him."

Sumbavu bowed in acceptance, but MacKinnie felt the war minister's intense gaze even as he left the room.

MacKinnie used two more weeks preparing for the battle. His entire force of citizens and peasants was trained, with his original group dispersed through the ranks as fuglemen. Stark drilled them relentlessly in the Temple courtyard, taking them again and again through the complex maneuvers which formed squares and columns, opened and closed ranks, brought their pikes to rest and present.

Brett and Vanjynk worked with the knights, shouting and cursing to try to make them understand that their great strength lay in a massed charge, and that they must return to the shield wall to regroup after each attack or they would be split apart and killed. Each evening they discussed the day's progress, talking late into the night, then rising early to drill the men once again.

On the night before the army was to go forth, MacKinnie held another conference. He looked intently at his officers seated at the thick wooden table in front of him.

"Mr. McLean, what of my infantry?"

"Better than when we went out last, Colonel. They've seen the way it's done now, and Stark sweated them until they're hardened up. Not like veteran troops, but they'll hold. Doubling the rations didn't hurt any."

"That was the colonel's doing," Mary Graham said. "He found

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someone who could be bribed at the warehouse."

MacKinnie shook his head. "Stark again, though I thought of it. I've never seen a commissary yet that didn't have a couple of people on the take in it."

"I hope there are none in mine," Mary said indignantly.

"There are, lady, there are," Stark injected. "Just hope their price is high and they're scared enough of you not to fill up the grain wagons with sand. It's been done to campaigns before."

"And your knights, Vanjynk?" MacKinnie asked.

"They drill well, they wheel to the trumpets, but they still do not like turning from the battle. Nor do I, but I see it must be done." Vanjynk lifted his cup and gulped wine. "You fight strangely on your world, starman."

"Lay off that talk," Stark muttered. "We got enough trouble with them Temple people without that."

MacKinnie nodded. "Hal's right. But tell me, will the knights obey the trumpets?"

"I believe so," Brett answered. "They have little wish to be killed by barbarians. But there is no fear of death in these men, only of dishonor."

"Aye, so Brett made a song about foolish knights who abandoned their commander and were shamed forever," McLean said. "Silly thing, but catchy. Seems to have helped."

"If songs help, sing your lungs out," MacKinnie told them. "The key to this whole battle is getting the heavy cavalry to bear on the barbarians while they're bunched up. Nothing on this world can stand up to a charge from those armored ironheads, but as soon as they lose their momentum and scatter the maris can pick them off with no trouble at all." He turned to Mary Graham. "Do you have all the supplies we ordered?"

She nodded. "We've made thousands of bolts for the crossbows, and the grain wagons are ready. You don't really have very many provisions, you know."

"I know. You're rolling plenty of empty wagons, though. Either we find something to put in them, or we'll come back home for more supplies. This formation's slow enough without heavy transport gear in the square."

"Then we're ready," Mary Graham said.

"Not you. You aren't going," MacKinnie told her.

"Yes, I am. It's no safer in here than out there. If your battle is lost, the city is lost as well and you know it." She looked around the room at the other men from her world. "I have a right to his protection, and I choose that he exercise it personally. Don't I have that right?"

"An interesting point," Longway said. "You cannot abandon her without finding a substitute guardian," the Academician told MacKinnie. "And doubtless she is entitled to

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someone of her own world. Who will you leave with her? Scholar Kleinst remains in the city, but for all his great value he is hardly a suitable guardian."

"I appear to be outmaneuvered, although why you should want to accompany an army in the field is beyond me, Freelady." MacKinnie looked at her expectantly.

"I see no reason to stay here," she told him. "There are few enough on this God-forsaken place that I can talk to, without being left with the Temple monks. Besides, I can be useful, or can you spare anyone else to manage your commissary?"

"The point is made." He turned back to the council. "Our whole purpose in this expedition will be to either force the plainsmen into battle on our terms, or destroy their base of supply. Either will be sufficient, although I doubt they will let us simply march out and burn their harvests without a fight." He indicated the map spread out on the table. "As near as we can tell from watching their movements, they've been harvesting the crops for the past three weeks. The nearest big concentration of grain is here, about thirty kilometers from the gates, assuming they use the roads and village structures. I rather think they will, from what I've been able to learn they often do that. We'll make straight for that and burn what we can't load up."

"Then what?" McLean asked.

"We see if they'll fight. If they won't, we keep marching from place to place until they're short of rations. But they'll fight all right."

"You may get more battle than you expect," Longway said. "You've hurt their pride with your last expedition, and they'll want to prove it was an accident. Next time, they'll press home their charge with everything they have."

"That's what I'm hoping for," MacKinnie answered slowly. "It will take them time to gather for the battle, and more to decide who leads it. By that time, we should have got to our objective and set up camp. They'll gather troops all night, and probably try to wipe us out in the morning."

"Then you're trying for one big battle," Mary said.

"Yes. One turn of the wheel, Freelady. We haven't a lot of time." He glanced significantly at the Makassarians at the table, then stood to dismiss the meeting. "Rest well, and be ready tomorrow. They may not let us get to the first village."

The army formed outside the city walls after first light. MacKinnie placed his men in a triangular formation again, but this time the broad base of the wedge faced forward, its point to the rear. He doubled the men on the right leg of the wedge, using all the lefthanded troops he could find for the forward elements of that line, and placing a large reserve force at the rear point. When he was satisfied with his arrangements, the drums beat their slow

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march, and the army moved forward.

Clouds of maris rode madly around, darting toward them, withdrawing, waiting for any opening in the shield walls, patient in the knowledge that the city army could never pursue them. The slow cadence continued, wagon wheels creaked and men shouted at the oxen drawing supply wagons, while the knights in the center impatiently led their mounts. Kilometer after kilometer they marched toward the enemy camp, as more and more barbarians joined the forces riding around them. They were completely surrounded.

"Reckon the city can hold with what we've left 'em?" Stark asked, looking back at the city in the distance. "You didn't leave 'em much."

"They'll hold," MacKinnie replied. "The enemy has no heavy siege equipment, and as long as the walls are manned the barbarians can't do much. Give them enough time and they could throw up ladders or even stack their saddles against the walls, but the defense can slow that down, and I don't intend to give them any time for stunts like that. We seem to be attracting most of them to us, anyway. What's Sumbavu doing?"

"He's riding with the knights, Colonel. Keeping an eye on those pretty uniformed swordsmen and archers, too. He don't trust you much."

"I don't blame him, Hal. I wouldn't trust me much either if I were Sumbavu. But what else can he do? Keep a sharp eye on him, I can't have him interfering."

"Yes, sir. You didn't put up much protest about him coming."

"Maybe I didn't mind him coming. Now watch him."

"Yes, sir."

The march continued, drawing to within a kilometer of the enemy tents. MacKinnie looked closely at the cluster of enemy in front of him. "They're trying to make up their minds. They don't want to give up all that grain without a fight. Watch that group there," he said, pointing. "Here they come! Beat the alarm!"

The drums thundered, then went back to their steady pace. The column continued to advance until the enemy was within bow shot. "Prepare for attack," MacKinnie said quietly, measuring the distance to the nearest of the plainsmen. "Form the wall." The drums beat again, and the Temple archers rushed to the perimeter, firing into packed enemy. The charge hurtled toward the broad front of the wedge, then wheeled around to strike the left end of the line. Pikemen rushed to the corner as echelon after echelon of the enemy plunged against the left leg of the inverted wedge.

The shield wall held. A few of the barbarians leaped over the first rank to land among the pikemen, their short swords slashing, but Temple guardsmen moved forward to cut

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them down. The battle was short, and when it was finished hundreds more of the enemy lay in front of the column. The men raised a cheer, cut short by the drummers' commands to resume the march.

"Not much of a battle," Stark commented. "Thought they'd try more than that."

"Testing us out," MacKinnie said. "They've found a way to get a few men into our lines now. They'll try that one again. Adaptable beggars."

"They have to be," Brett said from behind him. MacKinnie turned to see the singer walking patiently. "I left my mount with Vanjynk," Brett said. "You understand that there will be many more battles, each different from the last?"

"I understand. But how many more there will be depends on more than their intentions. For now, we take their supplies."

The enemy camp was deserted, the tents struck away. Huge piles of harvested grains, recently covered with hides but now left to blow about in the wind, and the scattered refuse of weeks of enemy life lay about them. Ditch, ramparts, and palisade rose around the campsite while the commissary workers began cookfires. A dozen singers strolled about.

MacKinnie moved through the camp, speaking to little groups of his men, encouraging them, testing their morale. It was hard to believe that only months before these had been the sullen slaves and beggars of the streets of Batav. Now they roared lustily at his jokes, shouted defiance at an enemy they could not see, and grimly held their weapons as if half afraid someone would take them. MacKinnie pitied anyone foolish enough to try.

The night was a turmoil. Under the two bright moons, masses of barbarians stormed forward, some mounted, most on foot, trying to find a weak spot in the perimeter, keeping the men aroused. MacKinnie sent small detachments of his troops to the center of the camp, replacing them with others, so that each man was able to rest for part of the night. Toward dawn, the attack died away, and he let the men sleep until late in the morning. The Temple swordsmen had born the brunt of the night attacks, and were most in need of rest. MacKinnie did not call them to breakfast until everyone else had been fed.

A kilometer from the camp, a mass of barbarians waited, strung out in a vast semicircle between MacKinnie's army and the city. MacKinnie had never seen so large a group of plainsmen before. As he stood atop the commissary wagon peering out at the enemy, Stark joined him.

"This going to be it, Colonel?" the big sergeant asked.

"Possibly. Let's see if we can get out of this camp. They figure to hit us as soon as there are enough outside the gates to make it worth-

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while." MacKinnie shouted orders, formed the men into ranks, then motioned to a trumpeter. The notes rang out, calling his officers to him. Moments later, the main gates opened.

MacKinnie sent a heavy detachment of shieldsmen angling forward and to the left from the camp gate. A second group angled off to the right, while others marched out to form a line between them, its ends anchored with the hard marching groups of picked men. When the left-hand group had left a large enough opening inside the wedge, the knights were sent forward until they were just behind the shield wall, at the extreme left corner of the inverted wedge the army was forming. Then MacKinnie sent the Temple archers forward, a line down each leg of his triangular formation, leaving none in the center. Whenever the maris approached the two legs of the formation, a shower of arrows greeted them, forcing them away. The enemy clustered around, moving toward the center where the resistance was least.

MacKinnie nodded in satisfaction. "Now comes the hard part," he muttered.

A charge of the barbarians struck the center of the triangle directly in front of the camp gates. The shield wall held, but gradually fell back, stretching thinner and thinner, bowing inwardly toward the gate as the heavier formations at the ends of the line held fast. More troops were sent forward to fill the gaps, keeping a continuous line, but still the enemy pressed forward, forcing them back, back, as more and more of the maris joined the attack. The formation bowed still more, resembling an enormous "U" with its base almost at the palisade. Hundreds, a thousand, four thousand barbarians pressed forward toward the camp gates.

"Now!" MacKinnie shouted. The trumpet notes sounded above the shouts of battle, drums thundered. The knights formed inside their bastion, then as the formation opened, charged down the wing, rolling up the flank of the enemy. The shield wall quickly closed behind them, then the ends of the U drew together. Archers faced inward now, firing into the ranks of the enemy, while the heavy cavalrymen thundered over the barbarians, riding them down, breaking up all signs of organization until they rode directly into the camp gate.

MacKinnie signaled frantically to Brett. "Form them up again and be ready to protect the outer flanks!" he shouted. "The archers and spearmen can deal with the ones we've trapped."

The field in front of the gate was covered with blood. Barbarians pressed closer and closer together as the shield wall, bristling with pikes, closed in on them. Temple archers continued the rain of arrows into the helpless enemies, too crowded together even to use their weapons

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properly, the inner group not able to strike a blow. A few raced frantically out the end of the trap before the heavy knots of men MacKinnie had sent out first made contact with each other and closed all avenues of escape.

The remaining enemies outside the trap attempted to aid their fellows, to be stopped by shieldsmen facing outward, slowly moving back as the inner lines moved forward. Concentrations of the enemy were broken up by charges of cavalry, the knights thundering over them and around the ends, wheeling back to enter the camp and regroup, while the Temple swordsmen defended the ramparts of the camp itself. The huge mass of doomed men in the trap could have broken through the thinner lines of the camp, or even the outer defenses of the trap, but they could not escape to fight, while the smaller numbers remaining outside were unable to help them, frantically falling upon the spears of the shield wall or trampled beneath the knights while their luckless fellows were relentlessly cut down.

The slaughter continued until mid-afternoon. At the end, hapless groups of the enemy threw themselves on the spears or clawed their way up the ramparts to be impaled by the swordsmen at the top, screaming desperately, their courage melted by the faceless mass of swords and the rain of arrows. As the pikemen passed over the dead, camp followers slit each throat and removed the arrows, passing them back to be fired again. Captive beasts were led through the lines into the camp to be tethered with the commissary oxen. The lines came closer together, closer, then touched. There were no more enemy in the trap.

"What do you propose for the morrow?" Sumbavu asked the council clustered around MacKinnie's campfire. "You have left thousands dead on the field, more cut down in flight by our knights. We can return to the city."

"No." MacKinnie stood, a cup of wine in his hands. "Until their supply base is destroyed, there is no safety for the city. We must continue to burn their grain."

"It is not their grain, but ours!" Sumbavu snapped. "You cannot burn this great harvest. It must be carried back to the city. Surely this march can be delayed for a time to allow us to provision the Temple! The Faithful are hungry, and they should be told of this great victory."

"You forget, there are many more of the enemy than we have killed," MacKinnie reminded the priest. "And we must not give them time to rest. We must pursue them endlessly until they go back to their wastelands in fear."

"I forbid this," Sumbavu said quietly. "We must take these stores of grain to the city. You will not burn them."

"Then I suggest you take them yourself, Your Worship," Mac-

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Kinnie told him. "Now that we have thinned their ranks, I believe we can do without the Temple swordsmen. I will need some of the wagons to transport grain for the army, but you may have half of them, and three hundred of the camp servants as well. It is only thirty kilometers, each can carry half a hundred weight of grain. That will leave little to burn."

"So be it. We set forth immediately."

"At night, Your Worship?" MacKinnie asked. "Is that wise?"

"Wiser than being caught by them in the daytime. I see that you will not escort me with your army, though it would involve only a day's march. I will so report to the Council."

"Two days march, Father," MacKinnie said quietly. "One each way. Not to mention the disorganization as each man ran in to tell his fellows of the glorious victory. We would lose many days, and for what? If the enemy is to be driven from the city, it must be done now."

"What need to drive them away, now that we have means to gather provision?' Sumbavu snapped. "We could return, and our Temple officers learn to command the soldiers, then set forth again. It would not be so great for you and your outlanders, would it? You must win yourself, for what purpose I do not know, but I tell you again, I know you do not have the good of the Temple first in your heart, soldier of the South. Were I not guarded by the Faithful of the Temple, I do not think I would return from this march alive." He stalked off into the night, his bodyguard following him closely.

"Go pick the most useless slaves of your group," MacKinnie told Mary Graham. "The blunderers, the tired animals, the wagons ready to fall apart, get them all out of here."

She studied him closely. "I'd almost think that's why you brought all that useless junk. And you added that group of convicts to my picked men . . . did you expect this?"

"Freelady, just get them moving," Stark said. "The colonel's got enough problems." He guided her to the granaries, set men to loading the wagons which were to go back to the city.

Two hours later, Sumbavu was ready to depart. He stood with MacKinnie at the camp gate, watching the sky. "In an hour the moons will be gone. You have not seen the enemy?"

"No, Father," MacKinnie told him. "But they will have men out there."

"There is less chance they will attack me at night than by day," the priest said. "In the dark they will not know that I have only the Temple soldiers, and they will be afraid." He watched the setting moons in silence until darkness came over the plains.

"I leave you my blessing," Sumbavu told MacKinnie. "Perhaps I have misjudged your intentions. May God accompany you."

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"Thank you, Father," MacKinnie said. He ordered the gates opened and watched the guardsmen and wagons leave. Each swordsman carried a bag of grain on his back in addition to his weapons, and the carts were creaking under the load. Convicts and slaves, lured on the expedition with promises of freedom and now sent back toward the city with staggering loads on their back, old oxen, carts with creaking wheels, all filed out with the proud guardsmen. A thousand soldiers and three hundred bearers left the camp before the gates were closed. MacKinnie returned to his tent. After a few moments, Stark and Longway joined him by his fire.

"They'll never make no ten kilometers by morning," Stark said. "Not the way they loaded themselves."

"I thought the priest gave them reasonable loads," Longway said. "They did not seem excessive."

"Sure, but the colonel gave 'em the pick of the loot before they set out. Wasn't a man there wasn't carrying five, ten kilos of junk stripped off the dead or picked up in this camp."

"That was generous of you," Longway said. "Extraordinarily so."

"There will be other loots," MacKinnie told them. "We'll have plenty of chance to get rich, but they won't. They've earned their share."

"Or will," Stark muttered. MacKinnie looked quickly at him, then stared at the fire in silence as Mary Graham joined the little group.

"Best get some sleep," MacKinnie told her. "Start early in the morning, and it's late enough now."

"I don't really need it," she laughed. "I ride a cart, remember?"

"Lady, if you can sleep in that cart under way, you'll be the greatest soldier's wife ever lived," Stark observed. "I'd rather walk, the way those things fall into every hole in the ground."

Mary laughed, looked around furtively, then said, "You wouldn't think the Empire would fall if we told them how to put springs in the carts, would you? But I guess it's too late now." She looked around her at the camp. The spear and shield troops were asleep in place around the perimeter, their shields propped up behind the palisade, pikes and spears ready at hand, while guards patroled outside the perimeter. "I suppose I should start the breakfast fires. No rest for the cooks."

"Don't bother," MacKinnie said. "There won't be breakfast in the morning. Another hour and I'll roust out the men I'm taking with me. You can feed the rest when we're gone if the enemy gives you time. I'll leave McLean in command here."

"You are dividing your force, Colonel?" Longway asked. "That seems unreasonable. How long will you be gone?"

"One day should do it, one way or another. Don't worry about it, Academician, we won't leave you for long."

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"What is all this?" Mary asked. "There's something strange going on here! I don't think I like this at all."

"Just go get some rest," MacKinnie told her. "Or if you can't do that, please excuse me while I sleep. We'll have to be up early. Hal, have the guard call me an hour before first light. My apologies, but I can't think clearly when I've had no sleep, and the enemy is still far too dangerous for my mind to be fogged." He strode to his tent and closed the flap. After a few moments, Longway went back to his quarters.

"Hal, what is wrong with him?" Mary asked. "There's something going on, isn't there?"

"Freelady, he don't like what he's had to do. I can't say I like it much either, but we don't see no other way. Now do as he says and go to sleep. I reckon I'd better lie down a couple of hours myself."

XV

An hour before dawn, MacKinnie woke the men and formed them into ranks. Half were detailed to guard the camp, returning to the walls. The rest, with the knights, were marched silently out the camp gates, striding briskly to the east, at right angles to the road to the city. McLean waved to MacKinnie with a gesture that was half a salute, then went back into the camp.

A kilometer away from the camp, MacKinnie turned the detachment toward the city. They marched in silence without drums, Stark moving up and down the line to make each man keep his equipment from rattling. The formation was two columns of fours, the cavalry inside, the soldiers moving swiftly along without wagons or noncombatants. The sky turned gray, then crimson as the first light fell over the field.

"Keep the pace up," MacKinnie told them. "Brisk, but not to tire yourselves out." He found it difficult to judge the capabilities of his men, although the months on the planet had softened his muscles. Even so, he had noticed that the Samualites were stronger than the natives of Makassar, and everything seemed easier to them, exactly as Midshipman Landry had predicted.

"Here're their tracks," Stark told him, pointing to the deep tracks left by Sumbavu's baggage carts. "Hard to tell how far they are ahead of us."

MacKinnie led them off a hundred meters from the trail, then marched the group parallel to it. They swung on in silence, now and again changing positions to send fresh men forward to break trail in the waist-high grasslike vegetation. The low hills of the plain closed around them, MacKinnie rushing forward each time they topped a rise. As they approached one low hill, they heard shouts from the other side. Drawing closer, the sounds resolved themselves into the din of a battle.

"Deploy the troops," MacKinnie

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said softly. "Columns of fours to each side."

The parallel columns split apart, wheeling perfectly to form a straight line, then continued the advance up the hill, the men helping each other with their shields, readying pikes. The knights were at the center with MacKinnie when they reached the top of the rise.

A thousand barbarians had swarmed over Sumbavu's column. A few of the Temple swordsmen still lived, huddled in knots of ten or twenty around makeshift protection of the baggage carts, as the maris swept toward them firing arrows and leaping on them with their swords. As they watched, another tiny group of scarlet livery vanished beneath a wave of plainsmen.

"Make your charge straight through them," MacKinnie told Vanjynk. "Cut through and go past, then wheel, dress ranks, and a charge home again. Don't stop to play with them, stay together as you've been taught. Now go."

Brett and Vanjynk waved the knights forward, gathering momentum as they rode down the gentle hill. The shield wall advanced at the doubletime, men trotting as the fuglemen shouted to keep them in line.

The maris saw the wall of horsemen plunging toward them, leaped for their mounts, scattering the loot they had been so anxious to gain, but it was too late. The lances came down, and now that they had been seen, MacKinnie waved to the trumpeters. The notes carried easily over the dewey plains as the knights charged home. Lances shattered, swords were torn from scabbards as the knights shouted triumph. A few remained to fight, wheeling about until they were pulled from their saddles by the lassos of the maris, or their mounts were shot from beneath them. The rest galloped past, riding the enemy down, thundering down the entire line of barbarians before wheeling at the top of the next rise.

The horsemen had broken the enemy when the shieldsmen arrived. Once again the wings of the shield line closed inward, trapping the enemy between ranks, while the knights charged home again, throwing back into the trap any of the barbarians who had attempted to escape, crushing all resistance. The plainsmen caught between the lines had no chance. They could impale themselves on the spears of the shield wall, or wait to be trampled beneath the knights. This time the slaughter was done quickly, for no one attempted to attack the infantry from behind. The plainsmen who escaped were glad of their lives.

They found Sumbavu at the head of the column, a group of swordsmen dead around his body. He clutched a sword with one hand and a crucifix with the other, and his eyes stared at the heavens. In his whole command, there were no more than fifty survivors. MacKinnie grimly formed his troop into columns and marched back to his camp, the carts

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rattling over the rutted plains, the groans of the wounded sounding over the creak of their wheels.

MacKinnie rested his men through the next day. In the late afternoon, a small party of plainsmen approached, wheeled outside arrow shot, and waved feathered lances above their heads.

"He wants to talk to you," Brett said. "It doesn't happen very often with city people, but they do have ways of ending wars between clans. He's treating you as the chief of a very powerful clan. The men behind him are family heads."

"How do I meet him?" MacKinnie asked.

"Go outside the gate with a group of retainers. I doubt if he'll trust you not to shoot him down if he gets in range. It's what always happens when they deal with city people."

"Can you talk to him? Do you speak their language?"

"You know I do, Starman, and you know why. I'll come with you if you like."

MacKinnie took Brett and young Todd, leaving Stark and McLean in command. Longway puffed after them, insisting, and MacKinnie invited him along. They walked out from the camp until they were near the extreme range of a crossbow, then halted, still barely within covering fire if it were needed.

Three figures detached themselves from the group, dismounted, and strode purposefully toward MacKinnie. A few feet away they grounded their lances and spread their arms wide, speaking swiftly in a guttural language MacKinnie had never heard.

"He says he comes to speak," Brett said. "He says you fight like a great chief. He says never before have the robed fools fought so well."

"Tell him I am a great prince from the South, and that I have come in a ship. Tell him a thousand more ships full of men like mine are coming, with many horses, and we will cover the plains. Tell him his brave people will kill many of us, but more will come, and soon there will be many dead on these fields."

Brett spoke quickly, waited for a reply, and said, "He says he is honored to meet a great prince from the South. He says he knew you could not be from the city. He asks how you will catch him."

"Say that we will come to his home in midwinter. We will burn his food and kill his beasts. But we do not wish to do this, for many of my strong men will die, and many of his brave warriors, and all for nothing."

"That ought to impress him," Brett said. He chattered to the plainsman, listened, then spoke again. "He's afraid of that walking wall of yours," Brett told MacKinnie. "He can imagine your troops pounding along in the snow, and it bothers him. He wants to know why you would do this."

"Tell him any way you want to," MacKinnie answered, "but here're

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my terms. They can have two days to get out of here. They burn nothing else, but they can carry whatever they can. At the end of that time, we'll kill every one of them we find. And, if they make any more hostile moves after today, we'll follow him to the end of the continent."

"He's not responsible for all of the maris," Brett said. "Just his own clan. He can't promise for the rest."

"Is this the leader of the biggest group?"

"Yes."

"Then he'll have to figure out how to drive the others out. He ought to be able to do it, but anyway that's his problem, not mine. Tell him."

Brett looked pale for a moment, stared intently at MacKinnie, then spoke at length. The sinewy man answered, then another of the attendants shouted. Brett shouted back, and their voices rose angrily before the chief spoke again more calmly. Finally Brett turned back "He'll try. Some of the others have already left. He'll get the rest to go along. They wanted more time, but I told them you were a madman, you'd taken an oath not to stop fighting if this war didn't end now. I think they'll go."

XVI

They entered the city in triumph. MacKinnie marched his weary troops to the Temple courtyard, then had the commissary department serve a feast. As the soldiers were eating, he sent for Father Deluca and the archbishop.

"Your Reverence," he told Casteliano, "you are now in command of this Temple."

"How is this?" the archbishop asked.

"The only military forces left in this city are about a hundred and fifty archers, another hundred swordsmen, the knights, and my army there. The knights aren't any match for these lads in a street fight. There's nothing to stop you from taking over, my troops will stay loyal to me."

"Surely you do not expect to make war on the Temple," Laraine said. "We have no wish to wade in blood up to the altar."

"You won't have to. While the rest of them were eating, I had Hal send a force of picked men to the key points. It's already ours, now we have to tell their ruling council and that Pope of theirs. Not all my men would fight for me against the Temple, but a lot of them would. I'd rather not fight over it though, we'd have trouble controlling the looters."

"But you have not yet told the Council? They still believe themselves the rulers of the city. And you have told them nothing about us." The archbishop stroked his chin carefully, then turned to Laraine and Deluca. "Go quickly and get our vestments. The gold ones, and the most ornate trappings we have. Quickly, there is no time to be lost! My son," he asked MacKinnie, "can

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you lend us some loyal men as attendants? And if you would have your most regal clothing brought to you, it would help. I believe there is a way this can be done without bloodshed." He looked down at the motley group in the courtyard, men shouting and drinking, the Temple guardsmen who had stayed behind joining in the merriment while grim-faced pike and shieldsmen stood guard on the battlements in knots of five.

The archbishop nodded grimly. "You have brought back none of the Temple swordsmen, and not all their archers. Father Sumbavu—how did he die?"

"He was killed with his men in an ambush by the enemy," MacKinnie answered slowly. "He was bringing supplies back to the city. We arrived in time to revenge him, but not to save him."

"I see. A thousand brave men, who served you well. A high price to pay for a city."

"Damned high," MacKinnie muttered. "God help me, there was no other way. You've seen these Temple fanatics. We'd have had to kill every one of those soldiers before they'd let us inspect their holy relics."

"The relics," Casteliano said slowly. "What is your great interest in the relics?" The priest looked at Nathan carefully. "Whatever your reason, you have done the Church a great service. I will not forget it. Now I have to tell that Council of theirs who really commands in this city. Your pardon, Trader. I must find a room where we can dress properly for our interview, and I would be most grateful if you could bring a dozen of your most loyal men."

Two days later, MacKinnie begged audience with His Ultimate Holiness, Primate of all Makassar, and Archbishop of New Rome. He was led into a small office behind the council room where Casteliano was seated in his shirt sleeves examining Temple records. The archbishop looked up and smiled.

"It was easier than you thought, was it not?" he said.

"Yes, Your Reverence. I still find it hard to believe that we had no bloodshed. But my men remain on guard, just in case."

"I told you there were few doctrinal differences, and these men are not only realists, but believers. If we had approached them from a Navy landing ship and demanded obedience, we would have had to demonstrate our power, but it would have been managed. As it was, arriving in the city like beggars, they would never listen to us. How could they believe we were great lords of the Church from the stars? But with you at our side, and your soldiers commanding their Temple, they had little choice but to listen."

"You were highly persuasive, Your Reverence."

"As were your actions. It was not difficult to make them see the hand

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of God in your victory, and His wrath in the death of Sumbavu. Did you foresee that as well?"

"No, Your Reverence."

"It is as well. Now what may I do for you?"

"I don't know how to begin. Yet I must have your help. I see no other way."

"Colonel—do not be surprised, the title is commonly used by your soldiers—you hold this Temple, not me. You could depose me as easily as you created me, particularly if you supported the Council against me. What is it I can do that you cannot do for yourself? Do you want to be crowned king of this city? They would do that for you."

MacKinnie laughed. "Nothing that simple. But . . . but may I speak to you in confidence? Have I earned the right to ask something which, if you refuse, you will not thwart me from attempting another way?"

The archbishop took a small strip of cloth from the table in front of him, kissed it, and placed it over his shoulders. "My son, for thousands of years the confessional has never been violated. By tradition, by the laws of God, and by the most stringent of Imperial Edicts what you tell me in confession can never be revealed. Have you something to confess?"

Nathan MacKinnie breathed deeply, stared at the old man, and thought for a moment before beginning. "All right. As you surmised, we are from a newly discovered planet which will be a Colony World when they get around to classifying us. They won't do that until we have a working planetary government, and King David's advisers are managing to delay that. We want to build a spaceship before they make us a Colony World."

"A spaceship! Just how advanced are you? What makes you think . . . no, how does this affect me?"

"Father, I came here to get copies of every technical work I can find in that Library. Our people think we can do it if we know how. I'm a soldier, not a scientist, and I don't know if they can do it or not, but we've got to try!"

The archbishop nodded. "You would try. Tell me, Colonel MacKinnie, are you typical of the people of your planet?"

"I don't know. In some ways, yes. Why?"

"Because, and I say it reverently, God help the Colonists they send to your world if you are. You don't know when to give up. Yes, I'll help you." He thought for a few moments, then laughed. "And we'll stay within the letter of the Regulations. Although I doubt that would impress the Navy if they found you smuggling copies of technical books. But Makassar is classified as primitive. Any art, or craft, found here can be taken to any other part of the Empire. It never occurred to them that anyone would use the Library for its knowledge. Yes, we'll help you and gladly. Think what a splendid joke

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on the Imperial Trading Association this will make!" He struck a small gong on the desk, and told the servant who entered in response, "Go to the holy relics and bring Brother LeMoyne, if you please."

LeMoyne was a small man, with sandy hair and flashing blue eyes. He knelt perfunctorily before Casteliano, kissed his ring, and said, "And what may I do for His Ultimate Holiness other than refrain from letting New Rome know his present title?"

The archbishop laughed. "You see why he will never be a priest. Tell me, can you make the holy relics speak yet?"

"The Library is in amazingly good condition, Your Reverence. The Imperials fixed much of the equipment when they made copies of the tapes. The Old Empire used nearly indestructible plastics for those spools, and everything has been preserved with holy zeal. It only needs a power source to make it work."

"What kind of power," MacKinnie asked.

"Oh, any good source of current. It would be no great trick to build one, but we couldn't let the natives see it operate."

MacKinnie sent for Kleinst, only to discover he had been assisting LeMoyne in the inspection of the Library.

"It's a simple photoelectric recording," Kleinst told MacKinnie. "Not greatly different from the photographic equipment we use at home, although more compact, and I don't understand some of the electrical gadgetry. I think we could read the tapes if we had them."

"But, of course, you will never be permitted to take them back to your planet . . . wait, surely they can be hidden among whatever trade goods you will carry," Casteliano said. "Now all that remains is to copy them."

"Brother LeMoyne has told me that is simple," Kleinst said. "There is a large stock of blank tapes in storage, and once the generator is constructed he can copy them." The scholar's eyes flashed as he spoke. "And there is everything here! Textbooks for children which tell of physical laws I never even suspected. Handbooks, maintenance manuals for equipment I can't describe. But with time, I'm sure I could learn how it works. If I can't, some of the younger students can be trained. Surely we can learn."

"We have to," MacKinnie said. "Learn it and use it. It's a long way to the stars, and we'd better get started." He turned to the Archbishop. "Thank you, Your Reverence. Now I'd better see to my ship. Before we can go to the stars, we first have to get back to Jikar."

As he left, Archbishop Casteliano looked to Kleinst, then at the retreating figure. "He'll get there. And his sons will be admirals. Now, young man, how is your generator? Will it be finished soon?" ■

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THE REFERENCE LIBRARY

P. Schuyler Miller

INSPECTION AND INTROSPECTION

To a scientist, "the Literature" may, in principle, mean everything ever published on a subject in which he is interested. To a critic, "Literature" usually means only that fragment of published writing which he considers "good."

This dichotomy is not, at second glance, quite as valid as it might seem. Only a struggling student is likely to try to discover everything written on a given subject; the scientist interposes a first screen to sift out everything pertinent to his special interest, then another to cut this fraction down to those papers which will help support his own findings and arguments, with some attention to the contradictory data and arguments he hopes to refute. In the end, he is left with his own selection of what is "good" . . . and that is his bibliography. The screening process leaves him with a selection that is not very different from the critics' more subjective choice.

Both, in their own different ways, and using their different criteria, are recognizing Sturgeon's Law . . . that "90% of everything is crud." The problem, with limited time and energy, is to find the 10% and concentrate on that.

Logicial? Practical? Of course. But whose 10%?

I am probably rationalizing far beyond my depth if I suggest that the rise of status in anthropology and sociology may have had an effect on the critical world. If only because the supply of recognized and accepted "Literature" has been worked over so long, by so many people, its students are turning their attention to the 90% . . . to something more like "the Literature" in the scientific sense. In the process, they have discovered science fiction.

You won't have learned it here, because my own academic contacts are negligible and I was only vaguely aware of what has been going on, but science fiction has been respectable in the United States at least since 1958, when the Modern Language Association held its first annual seminar on science fiction, and most definitely so since 1959, when Professor Thomas D. Clareson of the College of Wooster, Ohio, launched a journal of science-fiction criticism, *Extrapolation.* Formal and informal

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courses on science fiction are held in upward of a hundred colleges and universities, some of them taught by such practicing writers as Jack Williamson, "William Tenn," James E. Gunn—all veterans of Analog/Astounding—and Joanna Russ. A summer workshop at Pennsylvania's small Clarion College, at which a number of top SF writers have been instructors, and which has turned out some excellent writers, has just moved to Tulane University. And on the weekend of October 9-11, in Toronto, an imposing collection of writers, critics, philosophers, literary historians, fan editors, and what have you participated in the fourth "Secondary Universe" conference, which has also become the outlet of the newly formed Science Fiction Research Association.

All this is preliminary to calling your attention to the publication of a book which I can't possibly describe or review in the space we have here, but which I will thoroughly recommend to anyone who is seriously interested in what the world of serious literature is thinking and saying about science fiction. It is "SF: The Other Side of Realism," edited by Professor Clareson and published by the Bowling Green University (Ohio) Popular Press for $8.95 in hardback, $3.50 in paperback.

The book is a 356-page anthology of critical and bibliographical writing about science fiction, collected from scholarly journals and fanzines, and including excellent contributions from Russia, Poland and Germany, as well as from England, Canada and the States. I've tried to categorize and classify the papers, with total lack of success, because they cut across all the obvious boundaries. There are analyses of the work of such writers as J. G. Ballard, Kurd Lasswitz (the German pioneer) and Olaf Stapledon . . . but you will also find papers on John Brunner, John Boyd, Kurt Vonnegut, "Frankenstein," and Edgar Rice Burroughs' "Barsoom."

As in any field of scholarship, you will find no unanimity: people, professors and SF writers alike, speak their minds with full academic freedom. French critic Michel Butor takes SF writers to task for not devoting their talents to what might be called relevant exploration of an agreed-upon—and dismal—future society. American writer/critic James Blish rides to the defense of the genre he commonly tears to shreds as "William Atheling."

Two of the best essays, to my taste, are "Realism and Fantasy" by the Russian critic, Julius Kagarlitski, and a historical survey, "What Do You Mean: Science? Fiction?" by Judith Merril, who makes clear the reason for her switch in interest from SF as science fiction to SF as speculative fantasy. But you'll be sorry if you miss Samuel R. Delany's view from inside, "About Five Thousand One Hundred and Seventy-five Words," which really gets down to the giblets of science fiction as communication.

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And you'll be amazed at what you missed in John Boyd's "Last Starship from Earth" when you read Jane Hipolito's analysis of that fascinating—and almost neglected—book.

Did I say that there are twenty-six essays, articles, poems, and bibliographical contributions in the book? Twenty-seven, with Professor Clareson's introduction? You'll find some bloopers and some scholarly oversights—we never are told who wrote the ballad, "A Century Hence" in 1880, except that it was a Missouri lawyer named Paxton, and Hugo Gernsback tried to establish the term "scientifiction," not "scientification". You're going to find this a prescribed book in colleges for a long time to come.

THE HUGO WINNERS: VOLUME TWO

Edited by Isaac Asimov • Doubleday & Co., Garden City, N.Y. • 1971 • 654 pp. • $9.95

This blockbuster of an anthology contains all the novelettes and short stories—mostly science ficton, but in a few cases fantasy—which won "Hugo" awards between 1962 and 1970. It is a companion to the earlier collection of short fiction award-winners up through 1961.

During this nine-year period, definitions changed. Originally, one award was made for book-length stories and another for anything shorter, including what would now be called a "novella." With the 1967 awards, the "short fiction" category was divided into novelettes and short stories, and in 1968—perhaps as a move to match the Science Fiction Writers of America Nebula Award categories—the "novella" class was added.

In 1962, the first year covered by this anthology, the short fiction award went to Brian Aldiss' "Hothouse" series. The series was collected as a book, "The Long Afternoon of Earth" (Signet Books, No. T4557—75¢), so the stories are not here. Fritz Leiber's 1970 winner, the novella, "Ship of Shadows," apparently was tied up elsewhere and could not be used. However, you do have fourteen of the fifteen winners after 1962.

Only one of the fourteen stories, Anne McCaffrey's "Weyr Search" from the 1968 awards, originated here in Analog. It was the first half of her novel, "Dragonflight," and may very well have cost her an award for the complete book.

As for the rest, if you haven't been reading other magazines during the last nine years, this collection will give you an excellent idea of what they've been publishing. The stories range from "hard" science fiction—Larry Niven's "Neutron Star"—through such memorable middle-of-the-road stories as Poul Anderson's "No Truce with Kings" and "The Sharing of Flesh" and Gordon Dickson's "Soldier, Ask Not," to Harlan Ellison's three intense New Wave winners. The one out-and-out fantasy is Fritz Leiber's other winner, a

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deal-with-the-Devil yarn, "Gonna Roll the Bones." (As this is written, I'm waiting to hear what the 1971 winners were. There'll be a note about them soon.)

I have not mentioned the reason why you want to read these stories in this book, rather than in the other anthologies where you may already have seen most of them. Isaac Asimov has written a highly personalized introduction for each story—about the author, not the story. He gets across a lot of the friendly calumny that makes the Good Doctor a toastmaster par excellence for any SF gathering. There are others who shake his monopoly a bit, but Tony Boucher is gone, Robert Bloch stays on the west coast, and I've only just heard about E.C. Tubb on the international scene.

Be a public-spirited citizen. Blackmail your local public library into getting the book instead of replacing two worn-out copies of "The Love Machine." Then borrow it.

ABYSS

By Kate Wilhelm • Doubleday & Co., Garden City, N.Y. • 1971 • 158 pp. • $4.95

This title incorporates two curiously unsatisfying novellas or short novels, "The Plastic Abyss" and "Stranger in the House," of which the second is the more conventional, but somehow more believable.

"The Plastic Abyss" explores a hypothesis of the structure of time, in which past, present and future are *all coexistent* and an individual psyche can be in two places at once. This is, in fact, precisely what begins to happen to the story's heroine, Dorothy Hazlett. My complaint may be the conservative one that Miss Wilhelm doesn't explore the mechanism of what is happening deeply enough, but I suppose her point is that the mechanism is of no concern at all to the people to whom this is happening—and what she does explore is what happens to them in human terms.

The "Stranger in the House" is an alien which has long ago built himself a haven deep under an old house in the country. He is telepathic, but not in the neat and orderly way of conventional human/alien communication stories. The effect of his attempts to mesh minds is invariably traumatic . . . but at last he is sent a mind strong enough to make contact. It's far more conventional than "The Plastic Abyss," and I suppose the characters are less well developed, but somehow it's more believable. I'm just an old reactionary, I guess.

ANDROID AT ARMS

By Andre Norton • Harcourt Brace Jovanovich, New York • 1971 • 253 pp. • $5.75

In this latest of Andre Norton's juvenile science-fiction books she is launching a new series which promises to be a good one. As usual, the time is the far future, when mankind has scattered among the stars and

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evolved many inbred and exotic societies in the isolation of a shattered galactic empire. There, too, men come across the relics of the powerful, unknown races that evolved and disappeared long before humanity's turn came.

As this story begins, Prince Andas Kastor, heir to the throne of Inyanga, comes to himself in a cell on a distant planet, with a lapse of years, or decades, in his memory. He finds that his prison contains others like himself—key figures in galactic politics, who seem to have been spirited away at critical moments and put in cold storage by persons or beings unknown, for motives equally mysterious.

Andas and the feline alien, Yolyos, do find a way back to Inyanga, only to land up to their necks in even deeper and more disturbing mysteries involving parallel universes and beings who may be able to implant human psyches in synthetic bodies. Is "our" Andas—the Andas we are following—the original, or an android?

Intricate . . . colorful . . . full of deliberately unanswered riddles to tease and entrance the reader . . . this is Andre Norton better than she has been for some time.

GRAY MATTERS

By William Hjortsberg • Simon and Schuster, New York • 1971 • 160 pp. • $4.95

I may be misjudging the author of this little book, but I have the impression that he thinks he has discovered a highly original idea: that human brains can live, and be preserved, and go on living a kind of mental life apart from their bodies. Shades of "Donovan's Brain" and how many more?

With that complaint out of the way, I can say that he uses his idea well, but within the framework of mainstream—modern mainstream—fiction rather than science fiction. The rationale is sketched in rather than built up: a solution to the population explosion, in which humanity's brains are put into live storage, connected up to a computer, and educated along lines which have their inspiration in oriental mysticism rather than western science. There is an interesting concomitant, in that the seeming savages outside the brainbins are actually final-stage brains, restored to bodies.

Interwoven with this are the threads of two stories: a suitably sex-oriented affair between the fifteen-year-old boy who was the project's first successful experiment and a superannuated central European actress—carried out, of course, in their mutual electronically induced fantasy worlds—and the attempt of a maverick (originally black, of course) to "escape" and embody himself.

I said it was well done, and it is. I just wish that the author had had a little more experience with the "stereotypes" of science fiction. I think he'd have written a better book.

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produced soot and poisonous fumes was inconvenient, but who cared? Electricity meant jobs, and the first order of business was economic well-being: jobs, money, food on the table.

Today we have, by and large, economic abundance. True, the economy is in a tailspin—but we have the technical know-how to produce enough food and enough goods of all kinds to feed, clothe, house, educate everyone. The fact that we don't do these things well is shameful; there's no excuse for it except cultural lag.

Our technology, today, appears to be fully capable of maturing into a *second-generation* technology. That is, a technology that accounts for the side effects and by-products of the simple, first-generation tasks. Technologically, we know how to produce abundant electricity without pollution. We know how to control insect pests without overloading the environment with harmful chemicals.

We stand, then, at the crossroads between first and second-generation technologies. Which way will we go? Simple logic would point toward a rapid development of the second-generation technology, so we can have our cake, eat it, too, and recycle the waste products.

But what is the popular wisdom telling us?

First, that technology caused the problems we face, and, therefore, technology is bad.

Second, that technology is threatening to go beyond human control, and, therefore, technology must be stopped. Now.

Thirdly, by inference, that science must be stopped too, because science is the wellspring of technology.

Fantastic? People who live in plastic clothing and eat frozen foods and drive 300-horsepower cars loaded with air conditioners and stereos—crying that we must put an end to science and technology!

But it's happening. It's happening now. And the most dangerous thing is that our Government is listening and acting on the advice of the popular wisdom.

Research money is drying up. Never mind the statistics that the Administration releases to the press, ask your friendly neighborhood researcher. In terms of real dollars, of scholarships, graduate students, new program starts, any way you want to measure it, the throttle is being firmly and consistently pulled back almost everywhere in research. Throttle? To some scientists it's beginning to look like a noose.

The popular wisdom's attitude toward technology borders on hysteria. The SST was stopped at the prototype stage because of the pollution a fleet of hundreds of such planes *might* cause. No one knows if

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the pollution threat from SST's is real. But the threat alone was enough to get the program canceled. Perhaps, all things considered, that was the wisest move. But it was hardly a calm, dispassionate decision in which all factors were carefully evaluated.

Look at the popular wisdom's reaction to nuclear power plants. Very much the same as a 1930 physics professor's attitude toward interplanetary flight. The fact that nuclear power plants can provide clean electricity with about as much risk of radiation damage as we get from a strong solar flare has somehow been buried under wild fears of radioactive poisoning. The risks and dangers are there, certainly; but their size has been distorted completely out of proportion. Much of the so-called "energy crisis" we face today stems from the popular wisdom's fear of nuclear power plants. Who is responsible for this attitude? Any suggestions?

If we follow the popular wisdom and stop the development of science and technology, we will be unable to feed all the people on this planet. It's that simple. Already, thanks to the popular wisdom, we're being asked to taper off on the amount of electricity we use. Fuel will be the next commodity to be rationed. Then food.

That's a future that's very possible. Even now, we are cutting back on the exploration of space, for reasons of economy. And we are seeing the

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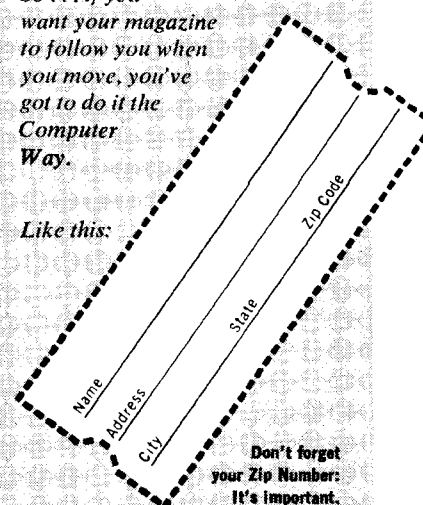

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proliferation of brutal "little" wars that smolder continuously—wars between the poor and the rich, nothing else. From Saigon to Attica, the poor against the rich. It has already started.

The alternative—one alternative, at least—is to use our brains and our technology to alleviate the problems that are destroying us. True, technology alone can solve nothing. Remember, technologically, *we already know how to cure* most of our population, pollution, food problems.

How can we marshal the forces of reason and humanity to solve these problems? What will happen if we fail? For, keep firmly in mind, the end of the world is nowhere in sight. The end of our civilization, yes, perhaps. The end of our current social organization, even more likely. But nothing on the horizon, not even nuclear war, seems likely to totally destroy the human race.

So what happens next? Do we win or fail? Do we build a golden era or a dark age? And what happens after *that?*

These are the ideas that make Analog tick. For more than thirty years, this magazine has been a place where you could go window shopping for the future; where you could look at possible tomorrows, judge their shape, their color, their texture, and prepare yourself mentally for what comes next.

That's the kind of magazine Analog will continue to be.

No, I don't mean "relevant" stories about how terrible it all is, and how a poor pitiful human being hasn't got a chance in this great big scary world. Hell, this world was made by human beings, its problems and its joys are the work of men and women. Men and women can solve those problems and appreciate those joys.

The stories in Analog will continue to be *science* fiction. That is, there will be a high content of scientific and/or technological background in them. The story problems will generally stem from the interplay between science/technology and human emotions. The science in the stories may be light-years ahead of anything known today—but it won't be anything that modern knowledge can definitely say is wrong. We'll play the game hard, but fair.

Needless to say—but I'll say it anyway—there will be fiction in the stories: human characters, people of flesh and blood, who sweat, who lose more than they win, who were alive before the first page of the story and will continue to live in your mind after the story is over.

Inevitably, Analog will change. So will we all, as time goes on. No one understood this better than John Campbell. Life *is* change.

It will take the best that all of us have—readers, writers, artists, editors—to keep Analog strong and growing. But what better monument could we build for John Campbell?

THE EDITOR

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